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ABSTRACT

A 2-year study of the health care industry in the San Francisco Bay Area identified avenues for reducing health care labor shortages. Focus was on classifications where demand was expected to grow and where current demand exceeds supply: nursing, medical imaging, medical therapy, and medical records management. A modified job analysis technique collected data through intensive interviews with subject matter experts, focus group meetings for data collection on occupational clusters, and surveys of major health care providers. Information obtained for each occupational cluster included the following: changes in settings in which these jobs are practiced, occupational skills that have changed in importance, skills important for entry-level jobs, and skills significant for career advancement. The study identified issues related to the role of educational programs in meeting labor supply and skill requirements in these occupational clusters, changing skills requirements that cross occupational clusters, and skill deficiencies identified by health care employers. Two sets of educational policy recommendations were made: one addressing integration of vocational and academic programs to increase the supply of personnel and another centering on articulated educational programs and their value in increasing labor supply through improved employee retention. (Appendixes, amounting to approximately one-half of the report, include a 91-item bibliography; medical imaging, medical therapy, and medical records occupations tables; and instruments. The occupations tables list skills, knowledge, and abilities that are important for advancement or have recently increased in importance.) (YLB)

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MEETING THE PERSONNEL NEEDS OF THE HEALTH CARE INDUSTRY THROUGH VOCATIONAL EDUCATION PROGRAMS

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FOREWORD

The National Center for Research in Vocational Education (NCRVE) conducts applied research and development in vocational education under authorization of the Carl D. Perkins Vocational Education Act. NCRVE supports research and publishes papers on issues related to vocational education in the United States. Among its several missions, NCRVE seeks to use the results of this research to shape debates over the role of education. Pursuant to that objective, NCRVE supports research on a wide variety of topics, including studies of changing employment requirements in various occupations and industries and the role that education can play in meeting changing employer needs. This study was conducted to support that objective.

This report presents the results of a two-year study of the health care industry in the San Francisco Bay Area. The study's major objective was to identify avenues for reducing health care labor shortages through cooperative efforts by health care providers and vocational educators. To achieve this goal, the research examined the changing skills required for health care jobs; identified the implications of these changes for vocational education in the health sciences; emphasized the need to enhance occupational mobility and retention of personnel through articulated education programs; and created links between health care providers and vocational educators that could support ongoing communication about skills and employment needs in the health care industry.

ACKNOWLEDGMENTS

We wish to thank the many health occupations educators, practicing health care professionals, and health services administrators whom we interviewed and who responded to our surveys or participated in our focus groups. They were extremely generous with their time and provided us with the names of many other health industry experts whom we could contact to participate in this study.

We would also like to thank the more than twenty members of the professional working group who guided major decisions about the occupations on which to focus our research and also suggested the names of colleagues to participate in the study. While they do not bear responsibility for the conclusions drawn in this report, they played a key role in helping us achieve the exceptional cooperation that we received from the health care community throughout the San Francisco Bay Area. Special thanks go to Steven Glick, Vice President for Employment Training of the Bay Area Council, who helped us bring together this outstanding advisory group, and to Carol Marshall, Labor Market Analyst for the Labor Market Information Division of the California Employment Development Department, who provided us with considerable occupational skills data and a detailed review of the manuscript.

This report was prepared under a grant from the National Center for Research in Vocational Education (NCRVE) at the University of California at Berkeley. We gratefully acknowledge the encouragement and support of Charles S. Benson, Director of NCRVE, and Gerald Hayward, Deputy Director of the Center. The report was edited by Andrea Livingston and Stephanie Kuhn; graphics were developed by Leslie Retallick; and secretarial support was provided by Melinda Hobbs, all of MPR Associates, Inc. Their efforts and contributions are greatly appreciated.

EXECUTIVE SUMMARY

Continued Personnel Shortages Are Forecast

The demand for health care services continues to increase, due to an aging population, new medical technologies, the spread of epidemics such as AIDS, and Americans' high expectations for quality care. Although this demand has risen sharply, the supply of health care professionals has failed to keep pace. In recent years this labor supply problem appears to have grown, despite increased public recognition of the situation and its consequences.

The health care industry is one of the largest and fastest growing industries in the United States. In 1989 Americans spent $600 billion on health care, or nearly 11.5% of the gross national product (GNP). That figure is projected to rise to $1.5 trillion by the year 2000, representing nearly 15% of the GNP.

During the next decade some of the fastest growing health care occupations will be in fields where education and training typically occur in secondary, postsecondary, and adult vocational programs. These occupations include nurses, medical assistants, home health aides, and a variety of medical imaging technologists. At the present time, insufficient numbers of new workers are entering these occupations, bringing about chronic shortages in these and other health care jobs.

Skills Requirements Are Rapidly Rising

The inadequate supply of workers is only one facet of the human resource problem facing the health care industry. Concurrent with these shortages, health care providers—ranging from small nursing facilities to major medical centers—are also under substantial pressure to control costs. Productivity improvements, which often depend on increasing employees' skill levels or reorganizing their job responsibilities, have been one major way of achieving these cost controls. When combined with the demands of new, more complex technologies, this means that employees must have both advanced technical skills and the higher level cognitive abilities to perform effectively in a rapidly changing work environment.

The combination of insufficient supplies of new workers and rapidly rising skill requirements has created a major challenge for vocational educators to provide quality education and training in fields where the costs of new programs or program modernization are unusually high. Because students are unfamiliar with many of the high-demand health care occupations or must have rigorous preparation in math and science, the challenge is all the more difficult. Furthermore, some students have been discouraged from entering health care because they fear direct contact with patients.

Recognizing the importance of this labor supply and demand issue, NCRVE-affiliated researchers at MPR Associates have completed a study of health care occupations in the San Francisco Bay Area. Their goal was to identify avenues for reducing health care labor shortages through cooperative efforts by health care providers and vocational educators. The research emphasized increasing productivity by improving knowledge of the changing skills required for health care jobs; enhancing occupational mobility by identifying career paths that could be fostered through articulated education programs; and creating links between health care providers and vocational educators that could support ongoing communication about educational policies directed at supporting the health care industry.

The Bay Area Council, a business-sponsored organization that analyzes and addresses regional policy issues and represents more than three hundred of the region's largest companies, helped MPR Associates assemble study participants from the state of California, health care employers, and vocational education. Working closely with members of these three groups, the researchers conducted more than seventy in-depth interviews, held focus group meetings, and collected survey data from fifteen Bay Area hospitals. Study staff recommended the following educational policies to increase the supply of health care employees and improve the match between industry skill requirements and health occupations curricula.

Policies to Increase the Supply of Critically Needed Personnel

MPR researchers found that health occupations programs in the San Francisco Bay Area have failed to meet the region's recent and current needs for trained professionals in a variety of occupations. In fact, one of the most consistent findings across nearly all thirteen health occupations studied was the substantial magnitude of personnel shortages in the Bay Area. Moreover, projections indicate that these shortages are likely to remain or increase in the future. Other recent research suggests similar shortages are likely in other areas of California and the nation. Based on the study's findings, MPR researchers recommended several approaches for increasing the supply of health care professionals.

New and Expanded Educational Programs and Approaches

First, across all educational levels, health occupations programs need to be expanded. Through a variety of mechanisms, such expanded programs can assume a significant long-term role in ensuring an adequate supply of personnel. Certainly, additional funding to develop more educational programs with higher enrollments for occupations that are experiencing substantial shortages will increase the pool of trained, entry-level employees.

However, other important channels that do not require expenditures for new programs or increased enrollment capacity exist for augmenting the supply of health professionals. These approaches may be just as important as program expansion for increasing the supply of health professions because they can increase the volume of applicants to programs that are currently under-subscribed, expand the number of *successful* applicants, raise graduation rates, and reduce turnover among new employees.

Applied Academic Programs

Applied academic programs (AAPs) that combine education in academic subjects with concrete work-related experience are one recent innovation that can increase the supply of health care professionals in several ways. First, cognitive learning theorists argue that carefully developed and implemented AAPs can improve learning and increase students' active involvement in education. Second, vocational students often seem to view school as not being applicable to their future lives. Direct involvement in challenging work opportunities closely related to the curriculum dispels the sense of irrelevance. Consequently, expanding and developing new secondary-level health occupations preparation, especially applied health sciences courses, should increase the pool of employees simply by increasing the supply of high school graduates who are motivated to pursue health care careers.

In addition, rigorous and challenging secondary-level health occupations preparation programs will increase the proportion of successful applicants who enter postsecondary health occupations fields and will reduce dropout rates in these programs. In other words, by successfully completing these secondary-level programs, more applicants are likely to meet academic entry standards, especially in math and science, and to complete graduation requirements once they are enrolled.

Third, educators from a variety of health care fields who participated in this study confirmed that students with previous experience in health care settings are more successful in occupational training programs. Thus, especially when secondary-level programs include work options or clinical placements, early exposure to health care occupations and environments should encourage students who enjoy working in these settings to pursue further study and help to filter out those who do not enjoy health care work. This early, hands-on exposure to a set of job requirements and a work environment should serve to reduce the high dropout rates that exist in many postsecondary health programs and even in the early years of employment after graduation.

Finally, integrated vocational and academic programs in postsecondary health occupations programs should improve the communications and other nontechnical skills of students, thereby improving their job performance and opportunities for advancement. Better job performance should lead to higher job satisfaction and lower job turnover.

The Impact of Articulated Educational Programs

Health occupations programs should be coordinated across all secondary and postsecondary educational levels. The expansion of coordinated, or articulated, education programs is an important way in which multilevel planning for health occupations programs can increase the supply of health care professionals.

This research and other studies of health professionals at various occupational levels have shown that many individuals already employed in health care settings are highly motivated to move into higher-level occupations. Recent efforts in nursing education in California and other states have already produced an excellent model—one in which secondary and postsecondary programs are coordinated to facilitate continuing education for higher degrees and to foster upward occupational mobility by eliminating duplication of course requirements. The most effective of these programs have been based on fully coordinated planning that involves secondary/adult education, community colleges, and four-year postsecondary institutions.

Policies to Improve Needed Skills

Technical Training Highly Evaluated

Survey data collected for the study indicated that employers were generally satisfied with the technical skills training that new employees had received in secondary and post-secondary vocational education programs. However, they were less satisfied with the nontechnical elements of vocational programs. In the Bay Area, health care providers have assumed a strong role in supporting health occupations vocational education by participating in advisory committees, funding instructors, and offering clinical placements. Both employers and educators credited these industry-education partnerships with strengthening the technical quality of vocational programs.

Deficiencies in the Nontechnical Skills of Employees

However, employers frequently expressed dissatisfaction with the communications, leadership, and decision-making skills of entry-level employees in a broad range of occupations ranging from nurses and nursing assistants to physical therapists and physical therapy assistants. Because employees in all occupations studied need more effective communications skills than ever before, the inadequacy of these communications skills appeared to be a particular problem.

In every occupation studied, employees had assumed greater responsibility for explaining complex procedures to patients, were working with patients who were older or had language difficulties, and were required to produce more complex written documentation. The latter was the result of federal reimbursement requirements placed on hospitals and the more complex nature of treatment plans and staffing arrangements. Moreover, in many occupations employees were working more independently from physicians, because significant health care services had been moved out of hospitals or employees were using more highly technical procedures. As a result, employees needed better decision-making skills and the ability to function with more autonomy in a high-paced, stressful work environment.

Based on their findings, the researchers recommended improving the nontechnical components of health occupations curricula at all levels by increasing the focus of instruction on communications, leadership, and decision-making skills through the implementation of integrated vocational and academic programs. They concluded that a significant need exists for such integration in both secondary and postsecondary curricula.

INTRODUCTION

Statement of the Problem

The health care industry is one of the largest and fastest growing industries in the United States. According to the Department of Commerce, in 1989 Americans spent $600 billion on health care, or nearly 11.5% of the gross national product (Custer, 1990, p. vii). The Conference Board projects that this dollar figure will rise to $1.5 trillion by the year 2000 and will represent nearly 15% of GNP (Hamilton, Smith, & Garland, 1989, p. 12).

Due to a number of complex social, economic, and technological factors, demand for health care services continues to increase. The most prominent of these factors are (1) the aging of the U.S. population, coupled with the greater health needs of older persons; (2) the spread of new diseases, as diverse and varying in impact as Lyme disease and HIV/AIDS; (3) emerging medical technologies and treatments that can prolong life and improve its quality; and (4) growing public awareness of both disease symptoms and the potential benefits of preventive health care measures.

Although the demand for health care services has risen sharply, the supply of health care professionals has failed to keep pace. Unfortunately, in recent years this labor supply problem appears to be growing, despite increased public recognition of the situation and its consequences. However, projections indicate that some of the fastest growing health care occupations during the next decade will be those for nurses, medical assistants, home health aides, and radiologic technologists, perhaps helping to close the health care services supply/demand gap (Bureau of the Census, 1988, Table 626). At the present time, insufficient numbers of new workers are entering these occupations and the amount of allied health programs are continuing to decline nationwide, bringing about chronic shortages in these and other health care occupations.

Compounding this recruitment shortfall is the reality of high turnover in many health care occupations due to such factors as job "burnout" from stressful work environments and the growing availability, especially for women, of opportunities outside of the health care industry. Because these opportunities are perceived as offering better pay, improved working conditions, and faster advancement, they are highly attractive even to individuals who are well-trained health care specialists and who have established successful careers in the industry.

However, the inadequate supply of workers is only one facet of the human resource problem facing the health care industry. Concurrent with these shortages, health care providers ranging from small nursing facilities to major medical centers are also under substantial pressure to control costs. In many instances these organizations have translated this fiscal mandate into program developing that is designed to increase productivity. For example, they have directed their efforts toward reorganizing work responsibilities, including using lower skilled employees to provide some direct patient care; toward creating new lower level classifications of medical support personnel; and toward increasing the skills that employees must use on their jobs.

While the health care industry is experiencing personnel shortages and demands for improved employee productivity, the U.S. work force is shifting its demographic composition. With shrinking numbers in entry-level cohorts, growing proportions of minorities, and increasing numbers of educationally disadvantaged individuals joining the nation's work force, a new recruitment environment is being created within the health care industry. These emerging trends have decreased the pool of traditionally educated health care specialists who enter the industry after completing postsecondary programs. Because of this, the industry has been attempting to solve its personnel shortages through more systematic skill upgrading for lower-level workers and better career opportunities for nontraditional employees.

Recognizing these complex social and economic factors, the purpose of this study was to identify avenues for reducing health care labor shortages through cooperative efforts by health care providers and vocational educators. To achieve this goal, the research emphasized increasing productivity by improving knowledge of the changing skills required for health care jobs; enhancing occupational mobility by identifying career paths that could be fostered through articulated education programs; and creating links between health care providers and vocational educators that could support ongoing communication about skills and employment needs in the health care industry.

Objectives of the Study

With funding under the Carl D. Perkins Vocational Education Act through the National Center for Research in Vocational Education (NCRVE) at the University of

California at Berkeley, MPR Associates, Inc., in cooperation with the Bay Area Council, conducted a two-year study on vocational education and related employment issues in the San Francisco Bay Area health care industry.

The Bay Area Council, a business-sponsored organization composed of more than three hundred of the region's largest companies that analyzes and addresses regional policy issues, helped MPR Associates to assemble representatives from the state of California, health care employers, and vocational educators. Working closely with members of these three groups, the researchers sought to understand the changing skill requirements of health care occupations, to assess the implications of these changes for vocational education in the health sciences, and to improve the ongoing use and exchange of information between health care employers and educators.

To accomplish these goals, the study established these major objectives:

- To identify important and changing occupational skills required in a broad array of health care occupations and to communicate these requirements to health occupations' vocational educators;
- To improve employee recruitment and retention in the health care industry by identifying actual and potential career paths within health care that could be fostered through articulated education programs;
- To produce a methodology for job analysis and evaluation of vocational education programs that could be replicated and applied in other industries that are undergoing significant social and economic transformations, and in locations that are facing labor market shortages; and
- To design and pilot an ongoing system for information exchange between employers and vocational educators that could be replicated for other industries and for the health care industry in other geographical locations.

The study's first two objectives stemmed from the rapidly changing social and economic conditions that the health care industry has been facing while attempting to meet growing public demand for cost-effective health care services. The third objective resulted from our knowledge of shortcomings in existing methodologies for analyzing occupational skills in dynamic work environments such as those in the health care industry. The fourth objective was defined to serve two purposes. First, it arose from the larger research agenda that NCRVE established to identify practical methods for improving employer input to vocational education policy. Second, it grew out of our desire to maintain the effective communication network established between educators and employers during this project even after the completion of the research.

In light of the growing emphasis that policymakers have placed on reshaping vocational education programs to meet changing work environments, the final objective of this project proved to be especially important. Although improved labor market information and increased interaction between educators and employers have been long-standing aims of vocational education policy, so far there has been little systematic research on how these objectives might best be accomplished. Policy has emphasized labor market projections by industry and occupation, which provide useful information on aggregate demand, but largely ignore changes in skill requirements. As a result, important implications for curriculum changes may be missed or recognized belatedly.

Policy has also encouraged employer involvement in vocational education through such methods as advisory councils, but the precise roles for employers and educators have not been well articulated. Consequently, the effectiveness of such interaction tends to be uneven. Additionally, most public policy tends to take a one-way view of information flow, assuming that employers should communicate their needs to educators and that vocational educators should respond accordingly. Thus, the possibility of vocational educators making useful contributions to defining and organizing work is often ignored. In this study the researchers explicitly sought to design two-way communication channels about education and employment needs between the employer and vocational education communities.

To accomplish these four objectives, this study addressed three needs:

1. To identify more clearly the *kinds* of information needed by educators and employers to ensure that vocational education in the health sciences responds effectively to changing industry requirements;

2. To improve the two-way *exchange* of information between educators and employers; and

3. To enable educators and employers to *use* information more effectively to improve curriculum and teaching and to define and organize work better.

Scope of the Research

To define the scope of the study, the researchers made two decisions: the first concerned the geographic boundaries that would be used to define our data collection efforts, and the second concerned the types and numbers of health care occupations that would be covered. The eight-county San Francisco Bay Area (Figure 1) was selected as the location for our research.

Geographic Boundaries

Three factors motivated us to focus our research on the San Francisco Bay Area. First, labor markets in the health care industry vary widely with respect to the availability of personnel and educational programs. Consequently, they also vary in terms of patterns of supply and demand. For example, American Hospital Association (AHA) data indicated that in Florida registered nurse vacancy rates increased from more than ten percent in May 1987, to almost sixteen percent in May, 1988. In contrast, this AHA report showed that in Maine the registered nurse hospital vacancy rate declined from thirty-four percent to about seven percent during the same one-year period (Thompson, 1989, p. 7).

In addition, state and local demographics differ substantially, affecting how much demand there is for health care professionals in various specialties. Two obvious examples of these influences are variations in populations' age structures and their effects on demand for both acute and long-term care facilities, as well as the impact of large HIV/AIDS populations on acute and medical support care services. This variability in labor market dynamics was the primary reason for the selection of a limited labor market area for intensive study in this research.

Second, many health care occupations require licensing or certification in one state, but not in others. For example, California is one of a minority of states (Institute of Medicine, 1989, p. 239) that requires licensure of all practicing respiratory therapists. In contrast, all fifty states mandate that physical therapists hold licenses. These requirements influence the establishment of educational programs and the content of health occupations curricula. They also have a significant impact on the supply/demand equation, especially when credentialing requirements are newly introduced or altered. Consequently, this variability in licensing requirements also led to the focus on a single labor market in this study.

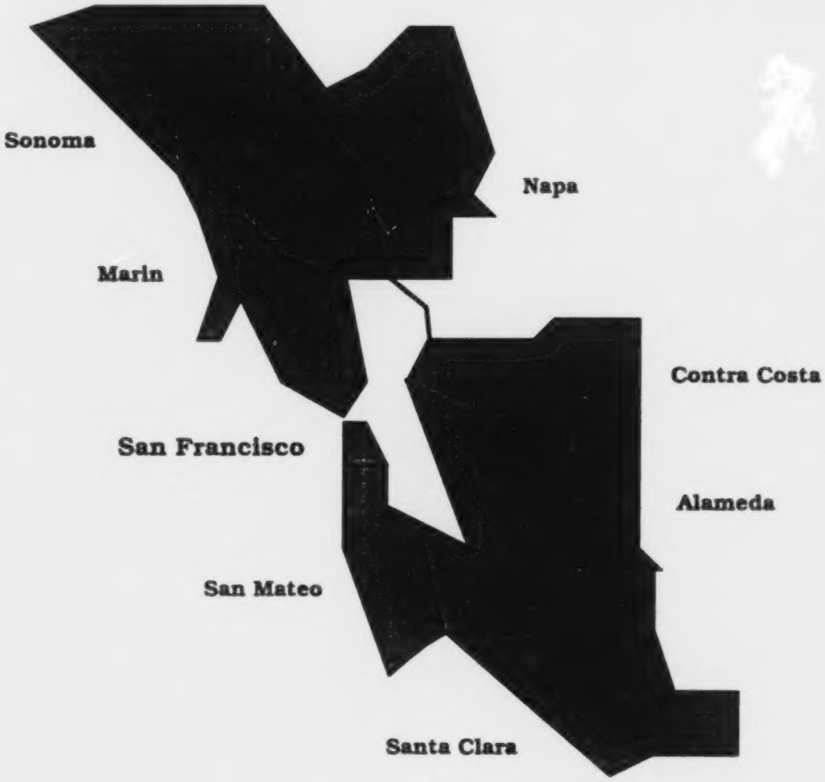
The third reason for limiting data collection to one major labor market concerned the major objectives of the research. A review of possible data analysis methods indicated that job analysis techniques were the most appropriate for examining detailed changes in occupational skills. The type of intensive data collection required for job analyses—which includes interviews, focus groups, and surveys—could most readily be implemented by confining the study's geographic scope to one readily accessible labor market. In a single labor market there would be one set of licensing and credentialing requirements leading to a fairly consistent set of occupational skills requirements for each job included in the study.

Occupational Scope

In response to the second question about research scope, the study's focus on vocational education policy led us to define a group of relevant occupations where education typically occurs in secondary or postsecondary vocational education programs. Most of the job categories that fall within this occupational group are generally referred to as *allied health occupations*, although in this study nursing classifications are also included.

Within the broad category of allied health classifications, the researchers then used a second set of occupational selection criteria to eliminate very small occupations, such as phlebotomists, and to focus on classifications where demand is expected to grow over the next three to five years, and where current demand exceeds supply.

Figure 1
Geographic Scope of the Health Industry Study


Sonoma
Napa
Marin
Contra Costa
San Francisco
Alameda
San Mateo
Santa Clara

Counties in the San Francisco Bay Area

Overview of Research Methods

The study relied both on numerous existing studies of the health care industry and data that Bay Area vocational educators and health care providers gathered explicitly for this research. To support these information collection efforts, the researchers established a Professional Working Group (PWG) composed of vocational educators, health care employers, and state employment data specialists.

Members of the PWG provided the study team with many references about recent research on the health care industry and on health care occupations. We supplemented this information with computer searches of the major library holdings at the University of California at Berkeley and at the University of California at San Francisco's Medical Campus. Moreover, members of the PWG recommended experts from educational institutions and health care facilities throughout Northern California who subsequently participated in all phases of the primary data collection. The researchers also asked these individuals to provide us with references concerning new studies and research findings about the health care industry and occupations.

The major data collection method used in the study was a modified job analysis approach that produced three lists of job skills for each detailed occupation including (1) skills that are important for the practice of entry-level jobs; (2) skills that are important for advancement; and (3) skills that have changed in importance over the past five years. Researchers compiled these skills lists by using a three-part data collection approach that involved the following activities:

- Intensive one-hour interviews with managers and employees who supervise and/or practice each occupation under analysis; these interviews were used primarily to develop preliminary task and skills lists for each occupation;

- Focus groups lasting two hours that included six to eight supervisors and managers responsible for each of the four job clusters included in the study; these focus groups served to verify findings from our intensive interviews and to address larger vocational education and employment policy issues; and

- Surveys of major Bay Area health care providers; data collected through these mail surveys increased our confidence about the reliability of occupations' skills lists by verifying information garnered from the interviews and focus groups, and by enlarging the number of institutions that provided input into the research.

Organization of this Report

The results of this research are organized in eight sections. The first section presents the rationale behind the study, identifies the scope of the policy issues and occupations covered in the technical portions of the analysis, and summarizes the research methods used.

The second section provides a background for the study by describing the social and economic environment affecting both the supply and the demand for health care workers nationwide and in Northern California. This section provides a persuasive argument for studying the changing skills required in the health care industry.

A detailed discussion of the study's methodology comprises the third section. It describes how specific health care occupations were selected for the analyses; the reasons that a job analysis approach was selected for this project; and the data collection methods that were used to analyze occupational skills requirements and to identify potential vocational education policy interventions that can influence the supply/demand equation in the health care industry.

The following four sections are the technical portions of the report. Each of these sections is devoted to one of the four occupational clusters selected for analysis. These sections discuss changes in the settings in which these jobs are practiced, occupational skills that have changed in importance over the past five years, skills that are important for entry-level jobs, and skills that are significant for career advancement. Two concluding units in each section address issues related to the role of educational programs in meeting labor supply and skill requirements in these occupational clusters.

The eighth and last section contains more general analytic and policy units that bear on all of the occupational clusters included in these analyses. This section focuses on findings about changing skills requirements that cross occupational clusters, and the skill deficiencies identified by health care employers. The discussion concludes with two sets of educational policy recommendations. The first addresses the possibility of integrating vocational and academic programs to increase the supply of personnel in the health care occupations, while the second centers on articulated education programs, their role in defining and encouraging career mobility, and their value in increasing the health care labor supply through improved employee retention.

BACKGROUND

Introduction

Employment in health-related fields rivals even the computer industry in terms of recent and projected employment growth (Bureau of the Census, 1988, Table 626). Accompanying the surging demand for health services, there have been dramatic changes in the jobs performed by health care specialists and in their work environments. These shifts resulted from a wide range of social and economic trends including the introduction of new technologies, the increasing complexity of medical knowledge, major transformations in the demographics of the American population, and government and industry efforts to contain health care costs.

These trends have affected virtually every occupation in the allied health field. For example, two fields as different as medical records administration and medical imaging have been greatly changed due to the combined impact of new technologies and social and economic shifts. During the last decade medical records occupations were transformed from a set of largely clerical and administrative support jobs into a critically important information management function, which is dependent on computer technologies and is central to institutional cost control efforts.

Over this period new diagnostic techniques arose from the emerging technologies of ultrasound, computer tomography (CT), and magnetic resonance imaging (MRI). In contrast to medical records jobs, where the content of existing occupations was substantially altered, in the field of medical imaging, entirely new occupations such as MRI and ultrasound technologist were created because of new skill and knowledge requirements.

Health occupations educators have grappled with these social, economic, and industry trends in their ongoing attempt to meet the changing labor force and skills requirements of the health care industry. Rising demand for health services, the changing nature of jobs within the industry (including the emergence of new occupations), and a mandate to reduce costs through increased productivity have produced a supply/demand imbalance in many health care occupations that continues into the present. Although health educators have worked hard to address this problem, expensive new technologies have raised the costs of upgrading programs and of developing new ones, frequently making program expansion either difficult or impossible.

This chapter presents an overview of the major social and economic trends that have affected the health care industry and health occupations education in recent years, with a focus on how they have influenced occupational supply/demand and skill requirements. These issues not only provided the background for both the research and policy recommendations presented in the remainder of the report, but also in many instances served as the initial impetus for the study. This chapter summarizes how these background issues previously affected health care occupations and predicts how these factors will influence the industry in the near future.

The Growing Demand for Health Care

Among the most important social and economic trends that have increased aggregate demand for health care services over the past decade are

- An aging U.S. population, which has increased demand for medical care in acute care hospitals, long-term care institutions, and rehabilitation facilities;
- Growing numbers of documented and undocumented immigrants, many of whom arrive in the United States with medical conditions indigenous to their native countries and without sufficient financial resources to obtain medical treatment;
- Emerging new diseases such as HIV/AIDS, which have encouraged the growth of newer forms of care such as hospice programs, and have led to faster implementation of experimental treatment programs in human populations;

- Developing new medical technologies such as computer tomography (CT) scanners, magnetic resonance imaging (MRI) machines, and bioengineered gene therapies, which have created new diagnostic and treatment methods; and

- A growing emphasis on personal health and prevention, stemming from improved public knowledge of disease symptoms and a recognition of the value of preventive health measures in reducing morbidity and mortality and in improving the quality of life.

Shifting Population Demographics: Aging of the Population

The growing numbers of older persons in our population has had a significant impact on the rising demand for health care nationwide. Since 1950, the proportion of individuals aged sixty-five years and older has more than doubled, with the most rapid growth occurring among seniors who are eighty-five years old and over (Siegel & Taeuber, 1986, pp. 77-118). This older segment of the population now places disproportionate demand on health care services, largely due to their higher rates of chronic medical conditions and functional impairments. In other words, the "oldest old" demand the highest level of health services of any age category (Rice & LaPlante, 1988).

Currently, the increasing health care needs of the elderly affect virtually every type of institutional medical setting from acute care facilities, which treat large numbers of older patients with more serious illnesses, to long-term care institutions and rehabilitation services, which treat older persons who have been discharged from acute care facilities, but who still require further medical treatment. Since older persons are quickly discharged from institutional facilities because they can receive more cost-effective treatment at home, the demand for home health care programs has increased substantially.

Undoubtedly, the growing proportion of older persons in the U.S. population will continue into the next century. In fact, by 2040 almost twenty percent of the population will be over sixty-five years old, whereas in 1980 this age group accounted for only eleven percent of our population (Hamilton et al., 1989, p. 76). While it is yet unclear whether further aging of the population will result from additional reductions in future death rates, it is likely that the population will continue to grow older if previous trends in birth and death rates are held constant. Nonetheless, even without further medical advances that prolong life, the aging of the population is likely to increase the utilization of the health care system in future decades.

The Expanding Immigrant Population

A second major demographic trend affecting the rising demand for health care has been the influx of immigrants to the United States and the great health care needs of these groups. For example, Southeast Asian immigrants have a significantly higher incidence of hepatitis B than the rest of the population (UC Berkeley School of Public Health, 1991). In addition, many immigrant groups are subject to other contagious diseases like measles that had been nearly eradicated among longer-term U.S. residents. These recently arrived groups also have substantial needs for hospital-based health care because their limited economic resources preclude their receiving preventive medical care, and consequently, they have more acute illnesses.

In addition to their significant health care service needs, nearly all immigrant groups present yet another set of demands on the health care system. That is, they require the specialized services of health care providers who not only are knowledgeable about cultural differences in attitudes about health and medical treatment but also are familiar with ethnic and national differences in the incidence of various conditions and illnesses.

The future impact of immigration on health care utilization is less certain than the impact of population age structure. Recent changes in immigration law will increase the number of immigrants to the United States (Vobejda, 1990). However, the new law has shifted admission priorities from a focus on family relationships to the occupational skills needed by American industry. This change may slightly reduce their demand for health services because larger proportions of future immigrants will be employed at higher income levels and will have greater access to preventive medical care services. Nevertheless, continuing immigration waves of individuals from lower socioeconomic groups will almost certainly place significant demands on the health care system.

New Diseases and Treatments

HIV/AIDS

The most significant example of a major new disease that has increased the level of demand for health care services is the HIV/AIDS epidemic of the 1980s. Along with substantial need for research funding to help curb this rising epidemic, the demand for direct patient care services has grown tremendously during the past decade. Recent studies estimate that from 1 to 1.5 million people in the United States are now infected with the HIV virus (Heyward & Curran, 1988). By the end of 1991, an estimated $22 billion in health care costs will have been spent as a result of this epidemic (Bloom & Carliner, 1988). The health care needs of HIV/AIDS patients have affected many sectors of the health care field, including several allied health occupations. For example, there is currently a great need for nurses, nursing assistants, home health aides, and respiratory care specialists to treat AIDS patients in acute care institutions, skilled nursing facilities, and hospice settings.

The future impact of the HIV/AIDS epidemic on demand for health care is difficult to project. However, if new and highly effective prevention and treatment strategies are not developed, the large existing HIV-positive population will require more direct patient care, and future demand for diagnostic and treatment services may be enormous, given the likelihood of higher HIV infection rates in the 1990s.

The Crack Cocaine Epidemic and Low Birth Weight Babies

While the negative impact of drug addiction on health is not a new issue, the crack cocaine epidemic of the 1980s, affecting the health of millions of Americans, has had a major impact on the acute medical care system. This epidemic has seriously affected health care utilization rates, in particular among addicted pregnant women and their babies. For example, babies of cocaine-using mothers are much more likely to be born at low birth weights and to experience a wide array of medical conditions. Although many of these children do survive, they place heavy demands on the health care system because they require neonatal intensive care services and subsequent treatment for a variety of drug-induced medical conditions.

The future impact of crack cocaine use on health care resources is difficult to estimate. While increasing drug education and interdiction efforts may help to check this epidemic, so far these efforts have not been highly successful. In fact, they may have led to more ineffective prevention efforts as well as a growing demand for health care resources.

The Impact of New Technologies

New technologies have affected health care utilization in varying ways. Their effects depend largely on the specific technology that is being used and the population to which it is being applied. In some cases these new health care technologies have dramatically reduced some types of demands on the health care system, especially when new diagnostic procedures have led to early corrective medical treatment, or when new, less invasive methods of treatment have reduced the need for surgery and postoperative care.

However, in other instances new technologies have increased health care utilization. For example, many new medical technologies have reduced symptoms and mortality from diseases such as cardiovascular illnesses and cancer. Furthermore, the widespread use of these technologies and their impact on prolonging life have enhanced utilization of medical facilities by increasing the number of individuals who benefit from new diagnostic procedures and treatments, and by raising the incidence of other conditions among individuals who live longer.

In some health care fields new technologies have expanded the range of treatment options and physicians' alternatives for treating various conditions. For example, joint-replacement surgery has improved the quality of life for individuals with joint diseases. However, at the same time it has increased the demand for surgical and rehabilitation services and for related hospital and home nursing care in situations where previous treatment methods were very limited.

The impact of new technologies on future utilization of medical care will depend on the pace at which future innovations are developed, the growth of new applications for recently developed technologies, and trends in restrictions on reimbursement for various diagnostic procedures and treatments. In one study on this subject, experts concluded that "after decades of growth, we should see a gradual decline in absolute numbers of diagnostic tests and procedures by the early 1990s" (Schmid, Poulin, & McNeal, 1986).

Health Promotion and Disease Prevention

With dramatically increasing health care costs and the concern that these expenditures have not produced sufficient health improvement, the health care community has become increasingly aware of health promotion as a way to prevent illness. As a result, they have been focusing on the impact of behavior and lifestyle on illness and the role that prevention can play in reducing the incidence of certain diseases. In fact, several sectors of the health care community, including the National Institute of Health (NIH), where the National Center for Nursing Research defined this as a research priority for the 1990s, have set health promotion as a national goal (Hinshaw, Heinrich, & Bloch, 1988).

Although one goal of the health promotion movement has been to reduce the demand for health care services, this emphasis has actually increased the utilization of some health care services. For example, our population's heightened concern over diet and nutrition has expanded the role of dietitians and nutrition specialists. In addition, with more individuals participating in exercise programs over recent years, sports injuries are on the rise, increasing the use of podiatric, orthopedic, and physical therapy rehabilitative services. The broader policy emphasis on health promotion has also created growing demand for preventive medical services from physicians and for health education programs supported by various health care disciplines.

The Growing Need for Allied Health Professionals

As the total demand for health care services has grown, so has the need for individuals who are trained in a variety of allied health occupations. Some of this increased demand has resulted from the factors described above, which expanded overall utilization of health care services and consequently of the health professionals who provide them. However, a second set of factors, some of which are independent of the larger trends in health care utilization and others in combination with them, have created increased demand for allied health professionals. These factors have affected allied health occupations by

- Shifting some types of medical treatment from acute to long-term care settings or to outpatient facilities and patients' homes;

- Changing the "staffing mix" of health care teams and altering the types and levels of personnel who provide various medical services; and

- Expanding the supply of certain medical services as new methods of medical care reimbursement have replaced existing ones.

The next unit addresses these influences on allied health occupations.

Changes in the Physical Setting of Health Care Delivery

Due to new technologies, cost containment efforts, and the prevalence of chronic illness, especially among the elderly, many types of medical treatment that were formerly offered in acute care hospitals have shifted to long-term care settings, outpatient clinics, or patients' homes. As a result, allied health occupations have experienced both increased demand and shifts in job responsibilities because in these nonhospital settings a substantial portion of direct patient care is provided by individuals working in nursing support or other allied health care occupations.

Physical and respiratory therapy provide two excellent examples of this pattern. Physical therapy has rapidly moved from hospitals to clinics, where costs are lower; to nursing facilities, where older persons receive long-term rehabilitation services; or to patients' homes, where patients with ambulatory problems are treated. The growth of the sports medicine specialty has also influenced the expansion of clinic services. While growth has occurred in all of these health care settings, some experts indicate that rehabilitation services provided at skilled nursing facilities may show the greatest increase in the near future (American Hospital Association, 1986, p. 80). Moreover, as our population grows older and there is more emphasis on health promotion and exercise, the demand for physical therapy services will continue to rise. Secondly, respiratory therapy has experienced similar, but somewhat more limited, movement to nonhospital settings because therapists have started to use mechanical ventilators and suctioning equipment to care for patients who are convalescing or coping with chronic illnesses at home (Institute of Medicine, 1989, p. 64).

Finally, accompanying the growth of these therapeutic modalities for home-bound patients has been an increasing demand for allied health personnel in home health occupations such as home health aides, and for licensed vocational nurses who provide nursing care at home. In all of these instances the reduced cost of providing medical services outside of acute care facilities, combined with an aging population, have resulted in more opportunities for allied health professionals to provide care and treatment to patients away from institutional settings.

Health Care Cost Containment

In a recent Delphi Survey, conducted by Arthur Anderson & Company and the American College of Healthcare Executives, panels of experts including hospital executives, physicians and nurses, trustees, consumer representatives, payors, and government representatives were asked to give their opinions on the future of health care (Yesukaitis, Carriere, Weil, & Stewart, 1987). The survey respondents ranked cost and payment issues second only to the aging of the population as having a major influence on the health care industry over the next decade.

This assessment was designed to address the tremendous increase in health care costs that occurred in the 1980s, as well the widespread impact of cost control activities on all aspects of health care today. To help remedy this situation, both government and payors have instituted many measures to control costs. For example, their most significant effort has been to introduce Diagnosis Related Groups (DRGs) for classifying and regulating government reimbursement to hospitals, and to use the prospective payment system that specifies fixed reimbursement levels to hospitals for various procedures.

Other kinds of cost control activities have been implemented as well. For the purpose of this study, one excellent example has been mandated or customary shifts in the medical personnel that provide certain types of diagnostic and treatment services. In many instances these shifts have increased the demand for personnel in a variety of allied health fields or have substantially altered their job responsibilities.

Another significant development in the cost control arena has been the rapid growth of health maintenance organizations (HMOs) as a major institutional source of health care. HMOs generally employ large numbers of allied health professionals and rely heavily on these professionals for both in-house and contractual services (Wilson, Rudmann, Snyder, & Sachs, 1989, p. 361). In addition, some institutions have shifted job responsibilities, expanding the job requirements of nonphysician personnel. For example, some of these institutions have required that plan-certified midwives, rather than physicians, handle routine pregnancies (Andrews, 1986, p. 51). A number of studies indicate nurses can frequently substitute for physicians at a lower cost (Gortner, 1982). Consequently, when there is no risk to patients, health care organizations may elect to reduce costs by shifting some responsibility from physicians to nurses (Andreoli & Musser, 1986).

Personnel shortages have also influenced staffing decisions that were made to control costs. In many HMOs and hospitals, staffing patterns within the nursing function have changed as shortages of registered nurses (RNs) and their rising salaries resulted in the reintroduction of team nursing. Under the team nursing approach, Licensed Vocational Nurses (LVNs) have assumed many of the basic patient care tasks that had routinely been part of the RN's job responsibilities under the primary care model.

The institutional arrangements providing some diagnostic procedures have also experienced this same shift, particularly in the field of medical imaging. As costs increased for housing imaging centers in hospitals, physicians were encouraged to invest in independent imaging facilities that could provide these diagnostic services at lower costs. Again, the movement of medical care to nonhospital settings—in this case combined with technological advances and broader applications—has provided additional employment opportunities for trained imaging professionals.

Regulatory, Legal, and Research Requirements

In a variety of health care occupations, growing regulatory and legal requirements have also been responsible for changing the work environment. To a large degree, these requirements emerged from federal, state, or institution-level cost containment efforts; technological advances; or a combination of the two.

Several factors have contributed to these regulatory pressures, most importantly the reimbursement requirements of Medicare and Medicaid and the accreditation requirements mandated by state law or by the Joint Commission on Accreditation of Healthcare Organizations. For example, in many health care occupations greater emphasis was placed on the precise recording of diagnoses and procedures and on a comprehensive knowledge of state and federal regulations, in order to ensure institutional reimbursement for medical services. In fact, the medical records occupations were significantly affected by these requirements as the entire field grew and changed. In fact, nearly all health care occupations experienced at least some pressure to conform to these precise reporting standards.

The health care industry has also been influenced by the need for more research to gather accurate data on the incidence of various diseases and on treatment outcomes. In part, these needs resulted from cost containment efforts that relied on evaluations of treatment efficacy. However, they also stemmed from efforts to improve epidemiological research in such areas as AIDS tracking and cancer and cardiovascular disease research, as well as from a growing public awareness of the importance of understanding how lifestyle factors affect disease prevention.

The Supply and Demand Imbalance in the Health Care Labor Market

This chapter presents information on the factors that have increased demand for health care services and for allied health professionals in recent years. However, to assess the level at which personnel needs in the health care industry are currently being met, it is also necessary to consider the other side of this equation: the supply of personnel in these fields and the factors influencing this supply.

Trends in the Supply of Health Care Professionals

Factors Affecting Supply

In recent years a combination of social, economic, and demographic factors have limited the supply of health care professionals. Briefly, these influences resulted from the following trends:

- Young, entry-level workers have traditionally been the new employees in the health care industry, and these cohorts have been shrinking in size over recent years. However, some of this deficit was made up by increasing numbers of older and reentry workers who moved into the health care field after working in other industries.

- Employment opportunities for women have increased, especially in higher-paying professional fields. Women have traditionally made up a disproportionate share of allied health and nursing occupations; however, as women began to enjoy increased occupational opportunities, fewer of them chose to enter traditionally lower-paid health care fields. In many instances, women who were already well-qualified health professionals left the field for jobs in other industries.

- Allied health and nursing programs have been expensive to establish and run compared with many traditional academic programs—due both to the cost requirements of new technologies in fields such as medical imaging and the low teacher/student ratios required for instruction in other fields such as nursing. Moreover, funding for health care programs has not kept pace with demand. Federal funding for allied health programs peaked in 1974 and diminished thereafter (Institute of Medicine, 1989, p. 87). While state and local funding are extremely important sources of support for these programs, these resources vary across locations. However, because allied health programs are expensive, they are often vulnerable to cutbacks.

DATA AND METHODOLOGY

Selection of Health Care Occupations

Focus on Labor Shortage and Vocational Education Policy

The previous section documented the proliferation of health care occupations resulting from advances in medical treatments, new technologies, and the increasingly specialized knowledge and skills required in various health fields. The U.S. Department of Labor's *Dictionary of Occupational Titles* (Employment and Training Administration, 1977; 1986) lists more than three hundred professional and nonprofessional occupations in which incumbents are charged with caring for sick and injured persons or typically work in settings used to care for these individuals. Faced with this large number of health care occupations, one of our earliest decisions was to choose a set of specific occupations for this study that would represent the major employment sectors in the health field that are experiencing labor shortages, yet at the same time would be analytically manageable in size.

Because of our focus on vocational education policy and sponsorship by the NCRVE, many health care occupations fall outside the scope of this research. Specifically, this study aimed to identify ways in which vocational educators could work with health care providers to reduce the labor market supply/demand imbalance and to identify those changes in vocational education curricula that would be responsive to evolving skill requirements in the health care industry.

With these interests in mind, we developed our primary occupational selection criterion, which was to include only those occupations where educational preparation typically occurs at the secondary or two-year postsecondary level. However, in a few cases, it was necessary to expand that definition to include baccalaureate-level occupations.

From this group we chose only those occupations that provide advancement opportunities from lower level jobs, and those with potentially articulated education programs that could improve employee retention in the health care industry by fostering career growth.

Role of the Health Occupations Study Advisory Group

Based on this secondary and two-year postsecondary education focus, the research staff established an advisory group to help us select occupations and to advise us during the study. This group included labor market analysts, secondary- and community college-level educators and program planners, and representatives from a broad array of San Francisco Bay Area health care providers including

- One health occupations analyst with the Labor Market and Information Division of the California Employment Development Department;
- Two specialists from the California Department of Education, Office of Vocational Education, Health Careers Program;
- One health occupations specialist from the Office of the Chancellor of the California Community Colleges;
- Two program managers from skilled nursing facilities, one specializing in geriatric care;
- Three deans of nursing or allied health programs at California Community Colleges;
- Three directors of human resource departments at major San Francisco Bay Area hospitals and medical centers;
- One director of human resources at one of the largest Health Maintenance Organizations (HMOs) in California;
- Two representatives from the California Office of Statewide Health Planning and Development;
- One director of a medical imaging department at a major research and teaching medical center;
- One manager of a private Magnetic Resonance Imaging Center serving a Bay Area hospital and outlying suburban communities;

- One representative of a local visiting nurses association; and
- One representative of a major private association of California hospitals.

This advisory group met quarterly throughout the two-year course of the study. They helped us develop criteria for selecting specific occupations for the study and recommended subject-matter experts for the occupational interviews, focus groups, and surveys that were used to collect occupational skills data. Moreover, the advisory group reviewed preliminary versions of interview and focus group protocols and job analysis questionnaires, and provided ongoing guidance about substantive research issues.

Occupational Selection Criteria

In consultation with the professional advisory group, the study team selected four families or clusters of occupations for analysis. Our decision to analyze clusters of occupations, rather than discrete occupational titles in unrelated job families, was made for two reasons.

First, this study identifies changing patterns in skills requirements across related occupations that might be linked to larger economic, social, technological, or policy issues. For example, our background research revealed that in some sectors of the medical imaging occupational cluster—such as electrocardiography (EKG), magnetic resonance imaging (MRI), computed tomography (CT), ultrasound, and nuclear medicine—the high cost of new technologies and investment tax incentives have motivated physician-investors to establish independent, free-standing imaging facilities that serve more than one hospital. Examining a set of related imaging occupations would enable us to explore the potential impact of these technological and financial trends on skills requirements across several occupations that are frequently practiced outside of a hospital setting. As a next step, these skill changes could be compared with those identified in occupations that are practiced within hospital or clinic settings.

Second, one of our major research objectives was to examine factors contributing to personnel shortages in allied health occupations and to make policy recommendations that might reduce these staffing deficiencies. Our hypothesis was that there are underutilized career paths across health occupations that could be developed and enhanced through articulated education programs and collaboration between education and industry.

Resulting improvements in career mobility would then help to reduce personnel shortages. Only by examining related sets of occupations could these potential career paths be isolated, through identifying shared skills requirements and progressions.

To select specific occupational clusters for analysis, we used the following criteria: (1) clusters should have substantial current employment levels; (2) demand for personnel in the occupational clusters currently should exceed supply; and (3) projections for the next five years should show increasing demand. Relying on data from the California Employment Development Department, Labor Market Information Division (California Employment Development Department, 1988) and the advisory group's recommendations, research staff selected four occupational clusters containing a total of fifteen job classifications as the focus of the study.

Occupations Included in the Study

Throughout the research and in this report, occupations are identified with the titles used by the California State Employment Development Department. These titles are generally recognized by California state licensing boards, and in most cases, they are similar to the ones that are used nationally. The following lists the four occupational clusters and the fifteen specific occupations selected for this study:

Medical Imaging Occupations

- Diagnostic Radiologic Technologist
- EKG Technician
- MRI Technologist
- Nuclear Medicine Technologist
- Radiation Therapy Technologist
- Ultrasound Technologist

Medical Therapy Occupations

- Physical Therapist Assistant
- Physical Therapist
- Respiratory Therapist

Nursing

Certified Nursing Assistant
Licensed Vocational Nurse
Registered Nurse

Medical Records Management

Medical Records Clerk
Medical Records Technician
Medical Records Administrator

Job Analysis and the Study of Occupational Skill Requirements

Rationale for Using Job Analysis Data in Research

This study used a modified job analysis technique to collect and analyze data on the changing skill requirements of allied health occupations and the interrelated skills of different occupations. Broadly defined, *job analysis* is a process by which jobs are disaggregated into their component parts, usually known as tasks, by using a systematic procedure for data collection, analysis, and synthesis (Bemis, Belenky, & Soder, 1983; McCormick, 1976). These methods often generate data on the relative importance of each task to overall job performance, and on the skills and knowledge required to perform each task.

Job analysis techniques were chosen for our data collection for several reasons.

- Job analysis data provide the specificity about occupational skills necessary for meaningful comparisons across occupations. These comparisons are central to the objective of identifying potential career paths where occupations require transferable skills or where they build on related skill sets.

- Job analysis methods are widely employed in industry to develop job descriptions that are used for hiring technically skilled employees. Consequently, it was anticipated that industry personnel participating in this study would already know how to complete job analysis questionnaires.

- Job skill elements generated from job analyses are very similar to the competencies that educators identify for competency-based curriculum development. Therefore, detailed occupational skill information would be useful to meet another study objective—to provide information for health occupations curriculum development.

However, it was decided not to use one of the existing standard job analysis techniques because they contained several inherent limitations. First, traditional job analysis methods are based on a static view of jobs and occupations, which would not help accomplish the objectives of this research that focus on identifying changing occupational skills requirements. Specifically, standard job analysis methods produce data on the tasks performed in particular jobs at a certain point in time—usually the present—without emphasizing how those tasks are evolving or without identifying the changing skills that are required to perform these jobs. The objectives of this study, to identify the accelerating influence of technology and the far-reaching demographic and financial trends affecting the health care industry, all prompted the need to use a more dynamic job analysis approach.

A second limitation of the traditional methods is their generally restricted concentration on the skills required to perform a job at only one level, with no explicit focus on the skills necessary for advancement. In conceptualizing this study, industry's need to reduce turnover by increasing upward mobility in the health care occupations proved to be a strong motivating factor. Consequently, one of our objectives was to identify occupational skills that could become part of curriculum development efforts to enhance the future upward mobility of health care workers.

To address these needs, the research staff developed a modified application of the task-inventory job-analysis approach (Bemis, Belenky, & Soder, 1983). This approach focused on gathering data on which job skills have changed, the importance of various skills for entry-level job performance, and their significance for advancement in a given occupation. The following section describes the methodology used in this study by presenting both the standard task-inventory job analysis and the modifications made to that approach.

Standard Methods of Task-Inventory Job Analysis

Standard task-inventory job analysis involves a three-step data collection process.

- The first step is to generate a list of job tasks. This information is gathered during *inventory construction interviews,* which are in-depth, face-to-face meetings between the job analyst and the job incumbents. In these interviews respondents provide detailed information about the specific tasks they perform in their jobs and the skills, knowledge, and abilities (SKAs) that are necessary to perform these tasks. The analyst does not present respondents with a pre-existing task list during the interview; instead respondents produce their own list, thereby reducing the impact of the analyst's biases on the data.

- The second data collection step involves creating task statements that describe job-related behaviors. These statements correspond to the tasks that were compiled from the interviews. Taken together, all of the task statements about a particular job constitute a *task inventory* that can later be used to identify task dimensions such as the frequency of task performance, the importance of the task to the total job, and the length of training time required to master a particular task. The complete task inventory is then converted into questionnaire form, and rating scales are assigned to each item to measure frequency, importance, and training time.

- As a final step, the job analyst evaluates responses to task inventory questionnaires and determines the relevant skills, knowledge, and abilities required for each task.

Data Collection Methods Used in This Study

The Dynamic Task Inventory Method

As discussed earlier, there were several objectives established in the job analysis segment of this study: (1) to identify how allied health occupations are changing with respect to their skills requirements; (2) to identify the shared job skills that bridge related allied health occupations; and (3) to identify the job skills that are critical for advancement in allied health occupations. With these objectives in mind, we used the following three steps in our modified task-inventory approach to gather job analysis data.

Intensive Interviews with Subject-Matter Experts

Health occupations analysts conducted inventory construction interviews (i.e., taped, face-to-face interviews that generally lasted about one hour), with individuals who are highly knowledgeable about the individual occupations included in this study. In consultation with our professional advisory group, respondents were selected to represent the full spectrum of work settings in which each occupation is practiced. For example, to analyze some of the occupations in the medical imaging cluster, such as MRI technologists, interviews were conducted with individuals working in hospitals, HMOs, and independent imaging facilities. In contrast, all of the interviews with nuclear medicine technologists were conducted in hospitals, the only setting in which these individuals practice.

The analysts conducted two types of interviews for each occupation. First, they interviewed senior-level administrators who were responsible for the overall administration of a department that included the job being analyzed. For example, the analysts gathered initial interview information about jobs in the medical imaging occupational cluster by interviewing administrative directors of medical imaging departments in various hospitals. Virtually all of these high-level management personnel had previously worked in one of the occupations that was being studied, before assuming management responsibilities. In some cases they were still working as hands-on managers.

For these interviews with administrators, the sessions began with a standard list of questions. However, discussions were generally very open-ended. These interviews with administrators not only provided information on the organizational context in which these jobs are performed, but also supplied us with many specific questions that were added to our interview protocol for job incumbents.

Second, analysts interviewed between three and five experts who were directly involved with each occupation included in the study. At least one current job incumbent, a supervisor of a department, and a community college or secondary-level educator responsible for courses in a certification or degree program for the occupation were included in this group. In virtually all instances the supervisors and the educators were previously incumbents of the occupation or continued to work as hands-on supervisors.

Analysts used a standard interview protocol for interviews with incumbents in all occupations, but also allowed time for respondents to raise important issues that might have been missed in developing the protocol (Appendix D-1-2). We were very successful in gaining the cooperation of Bay Area health care providers and educators for these interviews and were able to complete a total of seventy-three intensive interviews for the fifteen occupations included in the study (Table 1).

Table 1

Completed Health Occupations Study Interviews

MEDICAL IMAGING OCCUPATIONS

Diagnostic Radiology Technologist		
Dir. of Diagnostic Radiology	Eden Hospital	Castro Valley
Manager of Radiology	Mount Diablo Hospital	Concord
Director of Radiology	Pacific Presbyterian	San Francisco
Radiology Technology Dept.	Merritt College	Oakland
Coordinator-Rad. Tech Prog.	Canada College	Redwood City
Instructor-Rad. Technology	S.F. City College	San Francisco
CT Tech	Kaiser	Richmond
Vice Pres. Ancillary Services	Peninsula Hospital	Burlingame
EKG Technician		
EKG Tech.-Cardiology Dept.	Humana Hospital	San Leandro
Cardiac Technician	John Muir Medical Center	Walnut Creek
Mgr. Noninvasive Cardiology	Pacific Presbyterian	San Francisco
EKG Program Supervisor	John Adams	San Francisco
MRI Technologist		
Chief Technologist	North Bay MRI Center	Pinole
Manager of Ed. Training	Toshiba America MRI	S. San Francisco
Regional Manager	South Alameda MRI Center	San Leandro
Nuclear Medicine Technologist		
Nuclear Med. Tech Supervisor	John Muir Medical Center	Walnut Creek
Admin. Tech. Dir.-Nuclear Med.	UCSF	San Francisco
Radiation Therapy Technologist		
Instructor Rad. Oncology Dept.	S.F. City College	San Francisco
Manager-Rad. Therapy Dept.	Peralta Hospital	Oakland
Instructor-Education Dept.	Varian Industries	Milpitas
Ultrasound Technologist		
Admin. Dir. of Med. Imaging	John Muir Hospital	Walnut Creek
Ultrasound Technologist	Daly City Vascular Lab	Daly City
Program Director	Diagnostic Ultrasound Prog.	Los Altos
Program Director	Foothill College	Los Altos

Table 1

Completed Health Occupations Study Interviews (cont.)

MEDICAL THERAPY OCCUPATIONS

Physical Therapy

Physical Therapy Assistant	Kaiser Permanente	Santa Clara
Dir. PT Assistant Program	De Anza College	Cupertino
Physical Therapy Supervisor	Kaiser Permanente	Santa Clara
Owner	Physical Therapy Center	Oakland
Physical Therapist	Napa Valley PT Center	Napa
Dir. of Rehabilitation Services	Sequoia Hospital	Redwood City
Academic Dean	Samuel Merritt College	Oakland
Program Director	UCSF	San Francisco
Physical Therapy Supervisor	Kaiser Permanente	San Francisco
Physical Therapy Aide	Contract employee	Hayward
Academic Dean	Samuel Merritt College	Oakland
Physical Therapist	Oakland PT Center	Oakland

Respiratory Therapy

Tech. Dir.-Resp. Care	S.F. General Hospital	San Francisco
Director of Respiratory Care	UCSF Medical Center	San Francisco
Director of Respiratory Therapy	El Camino Hospital	Mountain View
Director of Respiratory Therapy	Napa Valley College	Napa
Instructor-Resp. Therapy Prog.	Foothill College	Los Altos
Blood Gas Tech/Resp. Ther.	UCSF	San Francisco
Registered Respiratory Therapist	UCSF Respiratory Care	San Francisco
Director of Respiratory Therapy	Mills-Peninsula Hosp.	Burlingame
Director of Respiratory Therapy	Kaiser Permanente	Vallejo

NURSING OCCUPATIONS

Coordinator, Nursing Med. Educ.	Mt. Diablo Adult Ed.	Concord
Vice Pres. of Patient Serv.	Queen of the Valley Hosp.	Napa
Assistant Director, Home Care	Mt. Zion Hospital	San Francisco
Patient Care Coord., Oncology	John Muir Medical Center	Walnut Creek
Home Health Aide Coord.	Marin Home Care	Corte Madera
Director of LVN Program	Merritt College	Oakland
Director of Home Care	Eden Hospital Med. Center	Castro Valley
Nursing Education Spec.	Eden Hospital Med. Center	Castro Valley
Dir. Nurs. Staff Development	El Camino Hospital	Mountain View
Professor of Nursing	CSU Hayward	Hayward
Nursing Instructor	San Mateo ROP	Millbrae

Table 1

Completed Health Occupations Study Interviews (cont.)

MEDICAL RECORDS MANAGEMENT

Medical Records Clerk	Garfield Geropsychiatric	Oakland
Coordinator of MRT Program	Chabot College	Hayward
Medical Records Coordinator	Hillhaven Convalescent Ctr.	San Francisco
Supervisor-Medical Records	Kaiser Permanente	Redwood City
Director of Medical Records	John Muir Medical Center	Walnut Creek
Asst. to the Administrator	Kaiser Permanente	Oakland
Instructor	Lodi Career Center	Lodi
Director of Medical Records	Mt. Zion Hospital	San Francisco
Director of Medical Records	UCSF	San Francisco
Medical Records Consultant	Medical Records Consulting	Forresthill
Director of Medical Records	El Camino Hospital	Mountain View
Principal Clerk-Medical Records	UCSF	San Francisco
Medical Records Technician	UCSF	San Francisco
Executive Director	CHS Home Health Care	San Francisco
Asst. Dir. of Medical Records	San Mateo Cty. Gen. Hosp.	San Mateo
Medical Records Technician	Mt. Zion Hospital	San Francisco
Director of Medical Records	Pacific Presbyterian	San Francisco

From written transcripts of these taped interviews, research staff compiled task inventory lists and identified the skills, knowledge, and abilities associated with performing major task areas. In addition, information was compiled on other important issues raised in the interviews such as reported changes in job responsibilities, anticipated future shifts in job responsibilities and skills, and questions about upward and lateral mobility paths.

Focus Groups for Data Collection on Occupational Clusters

After completing the in-depth interviews, we conducted a focus group meeting for experts in each of the four occupational clusters. Before each focus group meeting, the data compiled in step two was used to develop a questionnaire for that particular occupational cluster. The questionnaire was sent to about ten individuals who were experts in each occupational cluster, and they were invited to attend a two-hour focus group meeting and were requested to bring their completed questionnaires with them. The questionnaire covered issues that were raised in the interviews, specifically those related to health education policy and major social and economic issues affecting the delivery of health care and health care employment. The questionnaire items formed the basis of the focus group agenda. (Appendix D-3-9 contains a sample questionnaire completed by focus group attendees as well as a sample agenda and list of discussion topics used to organize the discussion at the meetings.)

A few exceptionally well-qualified individuals who had been interviewed attended each focus group meeting, in addition to some new study participants. Including previous participants served to provide continuity between the interviews and focus group meetings. All of the previous participants were either supervisors or managers of departments or were highly experienced health educators.

The focus group meeting also served a second important purpose. During this meeting we assembled representatives from all of the occupations within each cluster, thereby enabling us to address questions about interoccupational mobility, interrelatedness of training across occupations, and similarities among job tasks and occupational skills. These focus groups were very successful in bringing together high-level experts representing the diverse health industry and education sectors of the Bay Area (Table 2).

Surveys of Major Health Care Providers

Preceding our final data collection step, analysts compiled information from both the in-depth interviews and the focus group meetings and used this information to develop a second set of questionnaires, one for each occupation represented in the four clusters. We mailed these questionnaires to fifteen hospitals in the Bay Area (Table 3) so that current occupational incumbents could provide us with our final assessment of skills requirements and changes for each occupation.

Before mailing the questionnaires, we obtained the endorsement of the California Association of Hospitals and Health Systems (CAHHS) and its member hospital councils. That endorsement was included in our survey cover letter to provide added legitimacy to our request for participation as well as to increase our response rate. Our sample of fifteen hospitals was selected to represent Bay Area health care institutions according to the dimensions of size, public versus private institutions, geographic location (San Francisco, the South Bay, and the East Bay) and community versus research institutions.

Data from the questionnaires helped us validate the preliminary conclusions of the focus group and provided answers to additional questions that surfaced during their meeting. (Appendix D-10-142 contains all of the occupational questionnaires.) Response rates for the occupational surveys varied substantially across individual occupations, ranging from about twenty-five percent to more than eighty percent. However, these surveys were not intended to gather quantitative information, and they were adequate to provide a final validation of the skills information that had been generated from interviews and focus groups during the job analysis segment of our study.

NURSING CARE IN A CHANGING ENVIRONMENT

Introduction

This section differs somewhat from the later ones on medical records, medical imaging, and medical therapy occupations in terms of its objectives and organization. The discussions in subsequent sections rely heavily on the results of detailed job analyses—including interviews, focus groups, and survey data—to evaluate changing technical and nontechnical occupational skills requirements and to address labor supply and demand issues. Moreover, in studying those occupations, job analysis data and program availability information are used to determine how educational programs might meet the future skill and labor force requirements of the health care industry.

This section on nursing occupations also presents strategies for education policies and programs that can help to meet future skill requirements and the growing demand for personnel. However, the emphasis here is more on nontechnical areas such as communication, teamwork, and leadership skills and on programs to enhance recruitment, retention, and upward mobility in the nursing field than it is on recent changes in the technical elements of nursing education. Because there are several current analyses of both job and skill requirements in various nursing occupations (e.g., Limon & Hazelton, 1988; Zylinski & McMahon, 1990), we chose not to duplicate those efforts. Consequently, this section focuses primarily on the most significant problems facing the nursing field—shortages of critical personnel in a variety of nursing and nursing support occupations at a time when demand remains high and is expected to increase in the future, and the need for higher retention and improved mobility opportunities—and discusses educational program efforts that can contribute to solving these problems.

To address these issues, this section summarizes and builds upon several recent studies of nursing occupations, offers some projections of future nursing supply and demand, and proposes recommendations about how educational policies for both nursing and nursing support occupations can contribute to an adequate long-term supply of nursing personnel. To arrive at these recommendations, this discussion

- Reviews the supply and demand factors that have previously affected nursing;

- Identifies continuing and possible new influences that are likely in the future;

Table 2

Health Occupations Study Focus Group Participants

Medical Imaging Focus Group

Instructor-Radiation Technology	San Francisco City College	San Francisco
Chief Technician	North Bay MRI Center	Pinole
Medical Physicist	John Muir Medical Center	Walnut Creek
Director-Nuclear Medicine	UCSF	San Francisco
Dept. Mgr.-Noninvasive Cardiology	Pacific Presbyterian Med. Ctr.	San Francisco
Dept. Head-Radiology	Kaiser Permanente	Richmond
Prog. Dir.-Diagnostics Ultrasound	Foothill College	Los Altos
Program Supervisor for Allied Health	John Adams Comm. Coll.	San Francisco
Manager, Radiation Therapy Dept.	Peralta Hospital	Oakland
West Coast Regional Manager	South Alameda MRI Center	San Leandro

Physical Therapy Focus Group

Physical Therapist	Laurel Grove Hospital	Castro Valley
Manager of Physical Therapy	San Jose Medical Center	San Jose
Physical Therapist	Humana Hospital	San Leandro
Physical Therapist Supervisor	Kaiser Permanente	San Francisco
Manager, Physical Therapy Dept.	Alta Bates Hospital	Berkeley
Instr. of Medical Occupations	Eden Area ROP	Castro Valley

Respiratory Therapy Focus Group

Chief of Respiratory Therapy	Queen of the Valley Hospital	Napa
Respiratory Therapy Dept. Head	Kaiser Permanente	Vallejo
Technical Director	San Francisco General Hosp.	San Francisco
Director of Respiratory Care	UCSF Medical Center	San Francisco
Respiratory Care Practitioner	Highland Hospital	Oakland
Director of Respiratory Therapy	El Camino Hospital	Mountain View
Dir. of Cardiopulmonary Services	Eden Hospital Medical Center	Castro Valley
Instructor of Respiratory Therapy	Skyline College	San Bruno

Table 2

Health Occupations Study Focus Group Participants (cont.)

Nursing Focus Group		
Head, Surgical Nursing Dept.	El Camino Hospital	Mountain View
Director of Nursing	Jewish Home for the Aged	San Francisco
Director of Nursing Program	College of Marin	Kentfield
Director of Nursing	Kaiser Permanente	Walnut Creek
Director of LVN Program	John Adams Comm. Coll.	San Francisco
Medical Records Management		
Instructor of Medical Assisting	College of San Mateo	San Mateo
Director of Medical Records	San Francisco General Hosp.	San Francisco
Medical Records Administrator	Merrithew Memorial Hospital	Martinez
Director of Medical Records	Alta Bates Hospital	Berkeley

Table 3

Bay Area Hospitals in the Survey Sample

Alta Bates Hospital	3001 Colby St.	Berkeley
Brookside Hospital	2000 Vale Rd.	San Pablo
Doctor's Hospital of Pinole	2151 Appian Way	Pinole
El Camino Hospital	2500 Grant Road	Mountain View
Humana Hospital	13855 E. 14th St.	San Leandro
John Muir Hospital	1601 Ygnacio Valley Rd.	Walnut Creek
Kaiser Permanente	280 W. MacArthur Blvd.	Oakland
Eden Hospital	20103 Lake Chabot Rd.	Castro Valley
Letterman Army Medical Center	The Presidio	San Francisco
UCSF Medical Center	374 Parnassus	San Francisco
Pacific Presbyterian Medical Center	P. O. Box 7999	San Francisco
San Francisco General Hospital	1001 Potrero	San Francisco
Mt. Diablo Hospital	P. O. Box 4110	Concord
Saint Rose Hospital	27200 Calaroga Avenue	Hayward
Sequoia Hospital	170 Alameda	Redwood City

Table 4
Participants in Nursing Interviews and Focus Group

Interviews

Coordinator, Nursing Medical Educ.	Mt. Diablo Adult Education	Concord
Vice Pres. of Patient Serv.	Queen of the Valley Hosp.	Napa
Assistant Director, Home Care	Mt. Zion Hospital	San Francisco
Patient Care Coordinator, Oncology	John Muir Medical Center	Walnut Creek
Home Health Aide Coord.	Marin Home Care	Corte Madera
Director of LVN Program	Merritt College	Oakland
Director of Home Care	Eden Hospital Med. Center	Castro Valley
Nursing Education Spec.	Eden Hospital Med. Center	Castro Valley
Dir. Nurs. Staff Development	El Camino Hospital	Mountain View
Professor of Nursing	CSU Hayward	Hayward
Nursing Instructor	San Mateo ROP	Millbrae

Focus Group

Director of Nursing Education	Evergreen Valley College	San Jose
Instructor of Health Occupations	Eden ROP	Castro Valley
Head, Surgical Nursing Dept.	El Camino Hospital	Mountain View
Director of Nursing Program	College of Marin	Kentfield
Director of Nursing	Kaiser Permanente	Walnut Creek
Director of LVN Program	John Adams Comm. Coll.	San Francisco

- Establishes some alternative scenarios for future nursing supply and demand;
- Proposes elements of federal and state education policy that could help prevent future nursing shortages;
- Suggests program efforts in articulated nursing education that may increase the supply of nursing personnel; and
- Identifies nontechnical areas such as communication, leadership, and teamwork skills that could be strengthened in nursing education programs to increase productivity and improve retention in the nursing field.

The material in this section is based on two types of information: several recent studies on the nursing shortage conducted by professional organizations, hospital associations, state-level task forces, and private consulting groups; and data collected for this study from nurses, nursing administrators, and nurse educators from interviews, a two-hour focus group meeting, and questionnaires sent to fifteen San Francisco Bay Area hospitals. Table 4 identifies the professional positions and the types of institutional affiliations of the experts participating in the nursing portion of this study. In addition, the third section of this report contains detailed information on the advisory group of health care professionals who assisted project researchers in identifying experts to participate in all data collection activities.

The Nursing Shortage: Past and Present

Until very recently nursing was among the largest and most accessible occupations for educated American women. At the turn of the century, nurses and nurse attendants made up the second largest group of white-collar female workers, only surpassed in numbers by teachers (Oppenheimer, 1970, p. 69). Over the next seventy years the size of the professional nursing work force continued to grow, partially due to the fact that until the late 1960s approximately one-third of female college freshmen aspired to be nurses (Green, 1987b, p. 1610). By 1973, registered nurses constituted four percent of the white-collar, female work force, with nursing ranking only behind jobs for teachers and bookkeepers/cashiers as the largest nonmanual occupations in which women worked (Women's Bureau, 1975, p. 89).

As many women began to choose other occupations, this trend was reversed in the mid-1970s. In 1986, only five percent of women college freshmen planned on pursuing nursing careers (Green, 1987b). As a result, while many more women were working, fewer of them were entering the nursing field. Complex shifts in supply and demand variables, many of them resulting from the social and economic transformations of the 1970s and 1980s, accounted for this dramatic change in nursing enrollments and in the availability of nursing professionals.

Factors That Have Affected Supply

Historical Influences

Except for a brief period during World War II, until the late 1960s women faced limited opportunities in the labor market. In many fields substantial employment discrimination existed, presenting obstacles for women desiring employment outside of traditionally female-dominated occupations. Moreover, long-standing negative attitudes about women working also kept many of them out of the labor force entirely and identified only a limited set of occupations as appropriate for women. Along with discrimination, these attitudes perpetuated a very high degree of occupational segregation because successive generations of girls and young women based their employment decisions and career choices on culturally acceptable standards (Oppenheimer, 1970, pp. 67-68; Reskin & Hartmann, 1986).

These normative variables and labor market barriers greatly benefited American health care because they ensured a generally adequate supply of well-educated and trained female nurses, while at the same time they suppressed the wages of both men and women working in those fields (National Committee on Pay Equity, 1987; Oppenheimer, 1970, pp. 98-99; Snyder & Hudis, 1976). Because of these factors, enrollments in registered nursing programs continued to climb until the mid-1970s and remained fairly constant until 1983 (National League for Nursing, 1990).[1]

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[1] However, even the apparently high and stable nursing school enrollments during the 1970s were deceptively so because the large "baby boom" cohorts should have been producing much greater enrollment growth than actually occurred.

Recent Factors

More recently, social and economic trends began to shift the supply side of the nursing work force equation. For both structural and normative reasons, during the early 1970s women began to enjoy more occupational opportunities. First, shifts in the American occupational structure from production to service industries created rapid growth in the service sector, which had traditionally employed larger proportions of women than men. In turn, this expansion opened up additional employment opportunities for women in many traditionally female service occupations that began to compete with nursing for a growing female labor force. While the occupational structure as a whole remained heavily sex segregated, rapid growth in office employment drew women away from traditionally female occupations such as nursing and teaching.

Second, attitudes about women's employment began to change, and in a few occupational areas barriers to female employment began to erode. These attitudinal shifts provided a new set of opportunities for women who were choosing or changing careers. Employment options expanded in business, high technology, and professions such as law and medicine, attracting both male and female employees. These new work options tended to "pull" women out of the fields that had traditionally constituted their major career or work choices.

Equally significant were the "push" factors that drove many women out of the nursing field, especially in the 1980s. For example, in this decade significant cost control efforts were implemented by hospitals and other health care facilities in response to federally mandated programs. Most important among these efforts was the requirement that hospitals assign patients to diagnosis-related groups (DRGs), which defined the level of Federal Medicare reimbursement that a hospital could receive for a given treatment or procedure. Controls on nursing salaries were only one of many consequences of these cost-cutting efforts.

As a result of these cost control activities, wages in nursing remained low at a time when earning opportunities in other heavily female-dominated fields were increasing. For example, from 1983 to 1988 the average monthly salaries of educational and vocational counselors and wholesale and retail buyers—two large and heavily female occupations—increased by thirty-seven percent and forty-five percent, respectively, while nurses experienced average salary increases of only thirty percent (Bureau of Labor Statistics, 1989). Furthermore, in nine of the sixteen years between 1972 and 1987, starting salaries for registered nurses failed even to keep pace with inflation (Tolchin, 1989). Certainly the low entry-level salaries of nurses discouraged many young women who were making career choices in the 1980s from entering the nursing field.

However, the increases in entry-level salaries that hospitals began to offer in the mid-1980s in response to the emerging nursing shortage were not sufficient to stem the continuing attrition of experienced nurses. This was due in part to the severe compression in nursing salary scales, where many nurses reached the top of their salary ranges after five or six years in the field and could anticipate only a thirty percent to forty percent salary growth over the course of their careers (CAHHS, 1988; Friedman, 1990, pp. 2977-2978). In one recent survey with nearly one-thousand respondents, California nurses indicated that compensation issues, including both inadequate hourly pay and salary compression, were the most important factors that negatively affected their decision to remain in practice (CAHHS, 1988, p. 5). To the surprise of many health care administrators, early efforts to reduce the nursing shortage by increasing entry-level salaries had little impact because these adjustments did not affect the salaries of experienced nurses and did not solve the salary compression problem.

A second, albeit much smaller, factor that reduced the supply of nurses, especially in acute-care settings, was the growing acquired immunological disease (AIDS) epidemic. Like other direct-contact health care occupations, nursing gained the largely unwarranted reputation of a being a high-risk occupation—a view that discouraged some young people from entering the field.[2] In addition, some practicing nurses had the same concern about exposure to HIV/AIDS and either left the field entirely or moved into jobs without patient contact such as quality assurance, health education, and medical records management.

A third set of negative influences on the supply of nurses was the increasing cost of nursing education and decreasing availability of financial support for nursing students and nursing programs. In fact, federal funding for nursing decreased from $150 million in 1974 to $46.6 million in 1982 (CAHHS, 1988, p. 2), and state nursing education funds and government grants to nursing students also declined. Moreover, reduced financial aid for nursing students had a particularly important negative effect on enrollments because nursing has long been an avenue of upward mobility for women from lower socioeconomic groups. In this restricted fiscal environment, many students who lacked family financial resources may have been unwilling or unable to assume the debt that attending nursing school would have entailed (Hospital Council of Northern California, 1988, p. 6).

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[2] In a 1989 survey of 758 health care facilities, sixty-one percent of respondents indicated that the increasing incidence of AIDS was discouraging entrants to the nursing field (Michigan State University, 1989).

In some areas high failure rates on licensing examinations was another contributing factor to the nursing shortage. Between 1983 and 1987 failure rates on the NCLEX nursing test averaged between eight percent and eleven percent, but in July, 1988, that figure increased to more than sixteen percent. In six states failure rates were more than twenty percent (Mallison, 1988, p. 1566). Although many students passed these tests when retaking them, some discouraged test takers never repeated the exam or did not pass even when retested. With nursing school enrollments already declining, these high failure rates were another unwelcome variable contributing to the registered nurse shortage.

The stressful nature of many nursing assignments was the final factor that contributed to high attrition in the field. While this "burnout" problem among nurses was not a new phenomenon, as the nursing shortage became more severe and cost-cutting efforts increased, the extent of the problem was probably magnified. More nurses were fulfilling broader responsibilities in understaffed units, and they clearly indicated in recent survey data that these job pressures contributed significantly to turnover (CAHHS, 1988, p. 16). In a changing labor market that offered many more attractive employment alternatives, increasing numbers of nurses turned their dissatisfaction with working conditions and low pay into a career change.

The net effects of these "push" and "pull" factors were to halt growth in nursing school enrollments, raise turnover, and create a supply of registered nurses that did not meet the growing demand.

Recent Supply in California

Statewide, the recent deficit of registered nurses (RNs) in California has been even more severe than in many other areas of the country, although there were and continue to be significant variations in different regions. Between 1980 and 1986, the registered nurse supply for the United States grew an average of 3.7%. In California that increase was only three percent (CAHHS, 1988, p. 3). This seemingly small difference in growth rates has had significant implications because of California's rapid population growth. In that same time period, the U.S. population increased by only six percent, whereas California's population increased by 13.5% (Bureau of the Census, 1987, p. 8; California State Department of Finance, 1982; 1988). In addition, the prospects for future growth of the nursing work force after 1987 did not look promising because between 1982 and 1987 California nursing school enrollments declined by 15.3% (CAHHS, 1988, p. 3).

Factors That Have Affected Demand

Historical Patterns

For many years the demand for registered nurses remained generally in balance with the supply of personnel in the field. Due to growing demand, high attrition rates, and a large part-time labor force in nursing, even rising nursing school enrollments into the mid-1970s did not produce an excess of supply over demand. When relatively large numbers of new graduates were produced, hospitals reorganized nursing responsibilities to utilize this available supply effectively. Specifically, in the late 1970s many hospitals abandoned team nursing, which used relatively fewer RNs and more nursing support personnel, in favor of primary nursing, which relied almost exclusively on RNs.

Despite the long-term balance between supply and demand, the nursing shortage of the late 1980s was not the first occurrence of this problem. For example, nursing shortages during World War I resulted in calls for "volunteer nurses," and severe shortages during World War II led to the emergence of licensed vocational/licensed practical nurses (Friedman, 1990, p. 2978). In addition, short-term nursing shortages have occurred periodically since World War II. Most recently, although government analyses denied any significant deficit, hospitals indicated that there were distinct shortages of registered nurses in the early 1980s, when hospital vacancy rates for registered nurses were high (CAHHS, 1988, p. 3).

Recent Trends

The generally adequate balance between demand and supply that had been maintained began to erode after the mid-1980s. At that time the supply of nurses began to decline substantially, while demand continued to increase. The second section of this report described in detail many of the factors that affected overall demand for health care. These same variables influenced requirements for nursing care services. Briefly, the following represent the factors that played an important role in increasing the demand for nurses.

First, the aging of the population—resulting from the long-term decline in birth rates and from advances in longevity—greatly expanded the relative size of the population with the greatest health care needs. The very rapid growth of the population over age seventy, and especially over age eighty-five, had a particularly substantial impact on the need for health care, including nursing services.

A second factor that increased the demand for nurses resulted from the rapid expansion in the 1980s of ambulatory services; health maintenance organizations (HMOs); and other alternative delivery systems such as surgicenters, diagnostic centers, and hospices (U.S. Department of Commerce, 1986). As a result of national health care cost control efforts, these institutions grew dramatically. One major cost containment effort used by facilities such as HMOs was to establish generally higher nurse-to-physician ratios than did acute care hospitals, with nurses providing more direct patient care. Thus, as many Americans switched their health care plans to HMOs, the demand for nurses in these types of institutions increased substantially.

A third factor affecting the recent demand for nursing services resulted from the combined impact of cost containment programs and an aging population. Together these two trends produced dramatic growth in the long-term care services provided in several types of nursing facilities. Because patients were discharged from hospitals while they still required skilled nursing services, they frequently received this care at skilled nursing facilities or through home health care programs. These institutions and programs employed large numbers of registered and vocational nurses, as well as nurses aides. Consequently, extended care options contributed significantly to the growing demand for nursing services throughout all of the nursing occupations.

A fourth factor that increased demand for nursing services in the 1980s was new or significantly altered disease and illness patterns resulting from the AIDS and crack cocaine epidemics. Their impact was felt most heavily in acute care facilities that dealt with terminally ill AIDS patients, individuals suffering from drug overdoses, and increasing numbers of babies born to drug-abusing mothers. However, these epidemics also increased the demand for nurses to work as health educators in programs for AIDS and substance abuse and as care providers in long-term care and hospice programs for AIDS patients.

Similarly, the rise of homelessness and growth of the uninsured population increased the demand for nursing services in acute care facilities. Both the homeless and the uninsured are much less likely to seek medical treatment or to have access to physicians in the early stages of illness, or to receive preventive medical care. Consequently, their use of medical and nursing services in emergency rooms and hospitals is high, putting yet an additional burden on acute care nursing providers.

Long-term care was not the only sector affected by cost controls and an aging population. When combined with other factors, these economic and demographic trends created a demand for more intensified treatment in acute care facilities because patients entered the hospital in the later stages of an illness, had more severe symptoms, and were discharged earlier. Meeting the needs of sicker patients who required more complex treatment decreased the ratio of non-nursing to registered nurse personnel, creating more of a demand for potential RN employees (CAHHS, 1988, p. 3).

Recent Demand in California

All of the factors that have affected nationwide demand for registered nurses in recent years also operated in California. Shorter hospital stays for more severely ill patients, more technologically complex treatments, and, possibly, substituting RNs for other health care personnel, such as respiratory therapists, kept demand high or may have even increased it. At the same time that cost containment efforts resulted in strict utilization controls, the registered nurse portion of total hospital full-time equivalent (FTE) staff increased from slightly more than twenty percent in 1972 to almost twenty-six percent in 1986 (CAHHS, 1987).

Consequences and Responses to the Nursing Shortage

These shifting supply and demand trends significantly affected the structure, organization, and availability of nursing services in the 1980s. Most obviously, registered nurses were in very short supply, with hospitals experiencing RN vacancy rates averaging nearly thirteen percent in 1989, and nursing homes showing vacancy rates averaging almost nineteen percent. According to the American Association of Colleges of Nursing, by 1990 only slightly less than two percent of nurses seeking work were unemployed (Friedman, 1990, p. 2977).

The result of this shortage that received the greatest media attention was the increase in nursing salaries, first at the entry level and more recently throughout the salary structure. For example, in California, because demand significantly exceeded supply, especially in acute care facilities, nursing salaries increased twenty-five to thirty percent in the past five years (Organization of Nurse Executives, 1991). However, nurses did not experience this same salary growth in the long-term care sector, which largely addressed its RN shortage by increasing utilization of licensed vocational nurses (LVNs) and other nursing support personnel.

Higher nursing salaries often were not sufficient to solve the severe RN recruitment problems of hospitals. As a result, many hospitals faced another unfortunate consequence of the nursing shortage; they were forced to close beds, either temporarily or permanently. For example, in California in 1987, 448 beds were permanently closed and 1,650 beds temporarily closed. Hospitals indicated that the nursing shortage combined with a declining census as the primary reasons for these bed closures (Logsdon & Beghin, 1988, p. 6).

The reorganization of patient care delivery was a third result of the nursing shortage. Many hospitals returned to the concept of team nursing, which had been abandoned when these institutions implemented all-RN primary care nursing arrangements. Team nursing helped these institutions address the shortage of registered nurses by increasing the use of nursing support personnel such as practical/vocational nurses and nursing assistants, who worked together with RNs to deliver patient care. However, movement away from primary nursing may have inadvertently increased turnover among registered nurses who expressed greater job satisfaction with primary care nursing (Burn & Tonges, 1983).

A consequence of this return to team nursing in the late 1980s was increased demand for nursing support personnel, including practical/vocational nurses and nursing assistants. For example, one participant in this study who directs a program for LVNs at the community college level indicated that beginning in 1989, Bay Area hospitals not previously employing LVNs began contacting her to recruit newly licensed vocational nurse graduates.

Another study participant indicated that all students completing her certified nursing assistant (CNA) program have readily obtained employment upon graduation, and that several local nursing homes with consistently high CNA vacancy rates routinely offer bonuses to employees who recruit their friends from other facilities. Unfortunately, layoffs of LVNs and lack of demand for nursing assistants earlier in the 1980s led to the closure of many California programs that offered training for these jobs. Consequently, there frequently were insufficient numbers of trained LVNs and nursing assistants to meet the growing demands of hospitals and other facilities.

Some hospitals experimented with creating new nursing support categories to address their RN staffing problems. For example, the American Medical Association (AMA) authorized a pilot program in Kentucky to determine the value of using Registered Care Technicians (RCTs) to perform the least-skilled nursing tasks with physician supervision. According to the AMA model, registered care technicians would have been trained directly by hospitals for periods ranging from two months for assistant registered care technicians to eighteen months for advanced technicians (Felton, 1989, p. 2). After a storm of protest from the nursing community and charges that nurses would be held responsible for the care provided by registered care technicians whom they did not supervise, in 1990 this effort was abandoned.

By 1990, all of the responses to the severe nursing shortage and its consequences—increasing pay scales, widespread media coverage of the problem, greater use of nursing support personnel, and aggressive recruitment efforts by nursing schools—may have started to alleviate RN shortages in some areas. In fact, nursing school enrollments rose by an average of fourteen percent between the Fall of 1988 and 1990 (Lewin, 1990, p. 1). At some schools such as the University of Texas at Austin, nursing programs that in 1985 had accepted every qualified applicant, but continued to have unfilled places, in 1989 had many more qualified applicants than enrollment places. As further evidence of this shift, educators participating in this study mentioned that growing enrollment rates in nursing refresher courses by 1989 may have been an early indication of some registered nurses returning to practice.

California has also experienced a rise in nursing school enrollments. For example, the Chancellor's Office of the California Community Colleges reported enrollment increases of three percent in associate degree nursing programs from the Fall of 1988 to 1990, while statewide enrollment in baccalaureate nursing programs increased by twenty-six percent during that two-year period (RN Special Advisory Committee, 1990b).

Future Scenarios for Nursing Supply and Demand

Has the Nursing Shortage Ended?

Do rising enrollments in nursing schools and the reentry of some registered nurses signal an end to the nursing shortage nationally? Can educational programs stop their efforts to improve recruitment and to increase the supply of nursing personnel? Indeed it is too early to draw this conclusion, although the nursing supply situation looks promising and has already produced optimistic forecasts (Lewin, 1990, p. 1). However, data bearing on this issue are very recent, and one year's enrollment figures are insufficient to establish the long-term projections that are central to educational program planning.

In addition, nursing school deans, like administrators in many other professional schools, have indicated that media publicity about salary growth, or about personnel shortages in a field, often have significant and almost immediate short-term effects on enrollments. For example, the nursing school dean at a private Texas college and the engineering school dean at a public Tennessee institution recently indicated that newspaper stories about shortages in their fields consistently led to major increases in applications for the next academic year.[3] However, nursing enrollments nationally may have simply responded more slowly to information about shortages because of the field's continuing reputation for low wage jobs. If this is the case, recent stories about salary growth that circulated in the media were critical in increasing enrollments.

If media stories about the nursing shortage have contributed to ending the nursing shortage (Lewin, 1990, p. 1), it is also possible that as the shortage abates, the opposite will occur and the enrollment boom may rapidly come to a halt. Unfortunately, enrollment data for the Fall of 1990 and the Winter of 1991 may mask any underlying trend because recessions traditionally boost college applications by young people who face a discouraging job market (DePalma, 1991). As a result, the depressed economic situation in late 1990 and early 1991 is likely to have increased nursing school enrollments well beyond any growth resulting from increased interest in the nursing field.

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[3] Personal communications with the author, Summer 1989.

There is also evidence that in some areas demand for nursing personnel has been declining, probably as a result of the reduced utilization of health care services that traditionally follows a recession. This depressed recruitment situation may also contribute to the conclusion that the nursing shortage has ended and, unfortunately, may have the longer-term effect of reducing future enrollments. However, recent short-term fluctuations in supply and demand only reinforce the need for longer-term planning to meet personnel needs and a focus on the part of educational institutions that goes beyond meeting short-term industry requirements.

Many of the Same Supply and Demand Influences Will Continue

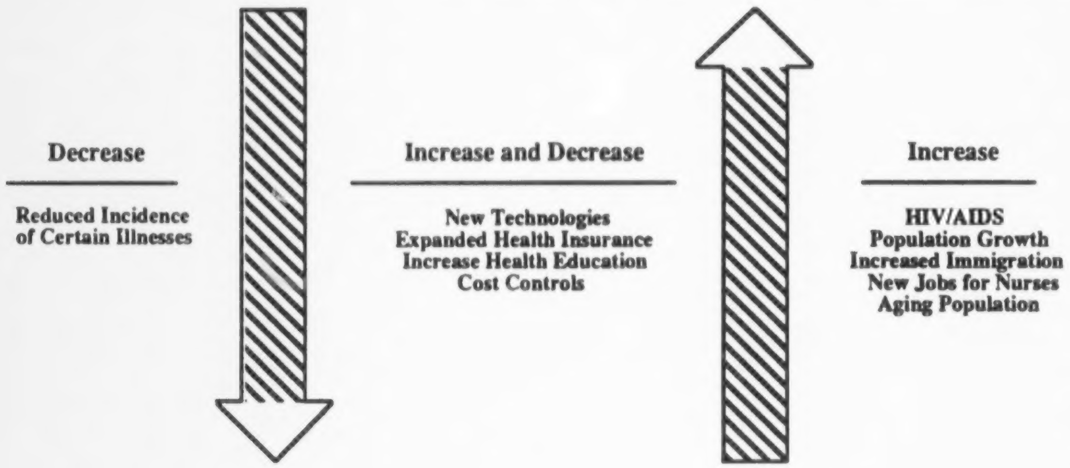
Forecasting labor market patterns is always uncertain. However, it is possible to identify the most important forces that will determine demand for nursing services in the coming years and to present some potential supply and demand scenarios. These projections can be made because many of the significant factors that have operated in recent years will continue into the future, and some of the present major influences have already begun to take effect. Figure 2 illustrates factors contributing to increases and/or decreases in the future demand for nursing services.

An Aging Population and Cost Control Measures

Two of the variables that had major impact on demand for health care and nursing services throughout the 1980s will have even larger effects in the 1990s and into the next century. Their impact will be felt throughout the nursing occupations. First, the U.S. population will continue to age, and this older population will require more health care services, including nursing, with the demand for these services increasing in both acute care and long-term facilities. After the year 2000, when large "baby boom cohorts" born in the late 1940s and 1950s begin to enter the age categories that disproportionately utilize health care services, this impact will be greatly felt. Second, cost control efforts that have been only modestly successful will become even more essential to respond to the aging population and its burgeoning health care demands.

Figure 2

Factors Affecting the Future Demand for Nursing Services


Decrease
Reduced Incidence of Certain Illnesses
Increase and Decrease
New Technologies
Expanded Health Insurance
Increase Health Education
Cost Controls
Increase
HIV/AIDS
Population Growth
Increased Immigration
New Jobs for Nurses
Aging Population

One consequence of these two influences will be a rising level of demand for nursing support services provided by practical/vocational nurses and nursing assistants that is likely to outstrip even the increased demand for registered nurses. Continuation of cost control efforts, managed care, and early hospital discharges, combined with greater use of long-term facilities by older patients, will heighten the need for nursing support personnel who are already heavily utilized in these facilities.

In addition, if the trend toward team nursing continues, this staffing strategy will also have a sharper impact on demand for nursing support personnel, or *nurse extenders,* than for registered nurses. Data showing a dramatic decline in vacancy rates of LVNs (Logsdon & Beghin, 1988, p. 2), interviews conducted for this study with hospital nursing administrators about their future staffing patterns, and interviews with educators who help place newly graduated nursing support personnel indicated that expanded use of nurse extenders in team nursing arrangements has already begun.

Growth of the HIV/AIDS Population

Even unforeseen breakthroughs in the prevention and treatment of HIV infection will leave the United States with growing populations of AIDS patients who had previously contracted HIV. With twenty percent of the nation's AIDS patients, California will experience a disproportionately large impact from this trend.

A lack of progress in controlling the spread of HIV infection could further increase the size of the AIDS patient population. Despite advances in HIV prevention, previously infected individuals in acute care inpatient settings will continue to need nursing services. In addition, larger numbers of AIDS patients will live longer due to more advanced treatments for AIDS symptoms and new medical procedures. Extending these treatments to a growing HIV/AIDS population will also increase the demand for nursing services in outpatient and long-term care settings.

Continuing Immigration

The new U.S. immigration law that went into effect in 1991 will shift the socioeconomic composition of immigrants to this country, and will increase the proportion of immigrants who have some financial resources and access to employer-paid medical care. This will, in turn, alleviate some of the burden on acute care providers, especially on emergency medical services. However, some immigration, both documented and undocumented, of groups with very limited economic resources will continue. These individuals will continue to place a high demand on health care services, especially in California, which has traditionally ranked near the top of destinations for new immigrants (McLeod, 1989).

Significant Population Growth

Some regions of the country, like California, demonstrated dramatic population increases throughout the 1980s and are expected to experience significant growth over the next five to ten years. For example, recent estimates suggest that California's population may increase by as much as twenty percent between 1990 and the year 2000 (Greene, 1989). Consequently, irrespective of factors that might reduce utilization rates of health care services, the sheer magnitude of population increases in some states and geographic areas will create much greater demand for health care personnel.

New Factors Affecting Supply and Demand

In addition to the factors that shaped supply and demand for nurses in the 1980s, new influences could be important in the years ahead. Because many of these factors are only beginning to emerge, the magnitude, or even the direction, of their impact remains to be seen. However, already there is evidence that these potential factors should be monitored in the future.

New Technologies

In many industries new technologies reduce employment by replacing employees with machines. In contrast, a U.S. Department of Labor expert argues that in health care "new technologies are the most important factor boosting demand for health services." The growing demand for nurses in the 1980s was one consequence of these new technologies, and their impact is likely to increase demand in the future (Pear, 1991).

In addition to influencing overall demand, new technologies such as point-of-delivery data collection systems, or bedside terminals, may also significantly affect some aspects of primary care nursing in acute care hospitals, particularly the relative demand for registered nurses. Specifically, the goal of hospitals introducing these systems has been to increase primary nursing hours devoted to care giving, by reducing noncare activities such as charting (California Medical Record Association [CMRA], 1987, p. 14). If hospitals are successful in using these and other technologies, this may affect the supply/demand equation for registered nurses in two ways. First, demand could decline as noncare activities are reduced and fewer RNs are required to staff nursing services. Second, supply could increase, as nurses become more satisfied with jobs that have greater patient care responsibilities and are less constrained by major administrative and housekeeping duties.

Health Coverage for the Uninsured

Universal health care insurance may be legislated at the federal level, although legislation on a state-by-state basis is more likely. An estimated thirty-seven million Americans do not have health care insurance (Schmitz, 1991, p. 40), and in California twenty percent of the population, or six million people, are not insured (RN Special Advisory Committee, 1990a). If for no other reason, the impact of mandating insurance coverage would be substantial because of the size of the uninsured population.

However, extending health insurance to the currently uninsured could have varying effects, depending on the type of legislation and the kinds of treatment covered. For instance, if coverage included preventive care, a significant increase in demand for office-related, ambulatory, and outpatient medical and nursing services would be likely. Because of better preventive care, potentially there would also be a decrease in demand for services in acute care facilities that have traditionally treated the uninsured only in crisis situations.

If HMOs became the providers of most or all of this increased coverage, nursing services in those institutions would certainly experience greater demand. Since HMOs already compete with hospitals for registered nurses, hospitals might experience more serious RN shortages, and the demand for nursing support personnel would also rise. In contrast, if only emergency and/or major medical conditions were covered, acute care hospitals would experience the largest growth in demand for services, and this would also translate into increased demand for nursing personnel, especially at the RN level.

Moreover, the future may bring expanded insurance options for long-term and home care services. In fact, some insurance policies have already provided these types of services. With more long-term and home care covered by private insurance, demand for a variety of health care services in these settings, including nursing, would increase. Rapid expansion of long-term and home care covered by insurance could force nursing salaries to rise in these traditionally lower-paid sectors. Another consequence would be that added pressure would be placed on acute care facilities, which now come out ahead when competing for RNs because they offer higher pay scales.

New and Expanded Jobs for Nurses

In both the public and private sectors, many new jobs will open up for nurses that do not involve direct patient care and that either expand nurses' current roles or create entirely new jobs for them. For example, more nurses will be serving as educators working in AIDS, substance abuse, and public health programs. In addition, academic and research activities will require additional numbers of nurses, especially as federal initiatives by the National Institutes of Health and other agencies expand nursing research and increase demand for nurses with doctoral degrees. These activities will create additional opportunities for nurses, especially for those who do not desire direct patient care positions or who want to combine patient care with other duties.

Private industry will also employ nurses to manage and staff health promotion programs for employees and health insurance cost containment programs. Another expanded job opportunity for nurses will be in working as discharge planners, who are employed by insurance companies to review patient care and assist in placing patients after hospital discharge (Schmidt, 1989, p. 7).

Several Future Scenarios for Nursing Are Possible

The combined impact of recent trends and new variables almost certainly will increase demand for nursing services. However, the supply side of this equation contains many more unknowns. Consequently, the longer-term balance between supply and demand and the potential for future nursing shortages can be viewed in terms of several hypothetical scenarios.

Nursing Could Operate in a Largely Unfettered Occupational Market

In one scenario, it is possible that nursing has already begun to resemble many other occupations that operate in a largely unfettered market, where supply and demand generally remain in balance. In these situations the supply and demand model is straightforward. External forces affect the demand for services (or products) and, consequently, determine employment requirements including the amount of new job openings. In nursing, these forces would be the social, economic, and technological ones described above. Given these demand patterns and available supply, occupational salaries either move up or down in relation to the balance between supply and demand. If demand far outstrips supply, as is the case now, wage scales rise and more individuals become motivated to obtain an education that prepares them for a high-demand occupation with rising wage rates. Once supply begins to catch up with demand, wage increases level off, applications for educational programs decline, and the supply of new employees again becomes balanced with demand.

Factors That Could Alter the Supply of Nurses

This long-term balance between supply and demand in nursing is not the only possible labor market scenario, however. Several factors could work together to constrain the supply of nursing personnel, sharply alter aggregate demand levels, change demand in one or another health care sector, and affect the supply/demand balance. The following are only a few examples of these potentially important influences:

- Current efforts emphasizing articulation programs between levels of nursing education could expand and help to increase the supply of licensed vocational nurses (LVNs), associate degree nurses (ADNs), and bachelor of science nurses (BSNs). Alternatively, these efforts could contract, reducing the supply of nursing personnel by limiting mobility from one occupational level to another.

- Available places for nursing students in educational institutions might not keep up with industry demand for new graduates. This would also create a new shortage of nurses.

- The BSN could become the entry-level credential for professional nursing practice. In some states like California, where two-thirds of new RNs are prepared at the associate degree level, this could create a new nursing shortage by limiting nursing enrollments for populations that traditionally begin higher education in two-year institutions. This could have a particularly large impact on California's rapidly growing immigrant and minority groups.

- Health care cost containment could produce renewed controls on nurses' salaries as a way of generating further cost savings. Those controls could create a return to nursing shortages by recreating an imbalance between nursing salaries and those in the larger labor market.

- New categories of nursing support personnel such as the AMA's registered care technicians could emerge and become widely accepted. In the short run this would likely reduce demand for existing nursing support personnel and, to some extent, also reduce that for RNs. However, the longer-term effects are less clear. If attrition rates in these low-level support positions were high—as some analysts predict they might be (Felton, 1989)—this staffing strategy might be short-lived, with hospitals rejecting the large cost of training a high-turnover population.[4]

Sectorial Imbalances Could Complicate the Supply Picture

One particularly likely scenario for nursing is that generally supply and demand will achieve a relatively good balance, but significant sectorial imbalances will occur. Under this scenario, current personnel shortages would disappear as compensation for nurses rose along with that of the general labor market, generating an increase in the available nursing work force. However, despite such aggregate balance, nursing could still face localized shortages, based on the proximity of nursing schools and programs for nursing support personnel, variations in cost of living, and the local mix of health care employers.

This scenario would mostly parallel the current situation in medicine where some metropolitan areas and some specialties are heavily oversubscribed, whereas acute shortages exist in rural areas and in specialties like obstetrics/gynecology. In nursing, acute care hospitals might maintain an adequate nurse work force by offering higher wages; HMOs could also remain successful RN recruiters by offering less stressful working conditions; and new nonpatient care jobs could attract some nurses. However, the long-term care and home health sectors could experience severe shortages because of their lower pay scales and much higher-than-average growth in demand. In addition, geographic areas with relatively lower costs of living or those that offer adequate opportunities for nursing education could enjoy generally good supply, while higher cost areas or those without nursing programs could experience serious shortages.

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[4] Two participants in this study indicated that a lack of upward mobility opportunities for certified nursing assistants was a major cause of high turnover in that field. They argued that CNAs moved from employer to employer as a major way to achieve salary growth because they have few alternatives. If new categories of "nurse extenders" face the same limitations on career mobility, they might behave similarly in the labor market.

Long-Term Solutions to the Nursing Shortage: The Role of Education Policy and Educational Programs

Although some disagreement exists on how great future demand will be, few analysts would deny that the supply of nurses and nursing support personnel needed to fill a variety of job classifications must grow in coming years. For the available nursing work force to meet and remain in balance with increased demand, it is critical that there be an adequate supply of newly trained nurses and that those who leave the profession do not exceed the supply of new graduates. Education policies at the federal and state levels can play important roles in ensuring this continuing supply by influencing enrollments and retention in nursing occupations. In addition, at the program-planning level, there are several strategies that educational institutions can implement to support continued supply growth. The following sections present recommendations related to education policy and programming that stemmed from the findings in this research and other recent studies of the nursing shortage in California.[5]

Federal and State Education Policy

Many of the factors that will influence demand for nursing services in the future either cannot be controlled—such as the aging of the population—or will largely be determined by federal health care policy, legislation, and the staffing decisions of health care providers. In contrast, the supply of personnel to all types of nursing occupations is directly related to education policy and program decisions about funding for nursing education, financial aid for nursing students, access to affordable nursing programs by students seeking enrollment, and opportunities for nurses to advance in their careers. Several of these education policy issues were addressed directly in the interviews, discussions, and surveys conducted for this study. When combined with the recommendations of other research on the nursing shortage, these findings provide evidence of the important role that policy change might play in ensuring an adequate future nursing supply. While the illustrations below refer primarily to California, and especially to the San Francisco Bay Area, in general these policy issues also apply to nursing programs nationwide, as well as to programs in other health care occupations.

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[5] A detailed presentation of analyses and recommendations concerning mechanisms for reducing the shortage of nurses is provided in the RN Special Advisory Committee Report to the California Legislature (1990a).

Increased Funding to Expand Enrollments

Both statistical data from recent research and interviews completed for this study suggest that at the present time California nursing programs do not have enough spaces to meet current demand, and future growth is likely to exacerbate this situation. Especially in the public sector, California registered nursing programs are completely subscribed. For instance, in 1989, twenty percent of applicants who were fully qualified could not be accommodated because of lack of space, and more than sixty percent of the two-hundred-thirty-two unfilled spaces were in private colleges (RN Special Advisory Committee, 1990a, p. 35). Further, many of the potential enrollees do not have the financial resources to attend these private institutions.

Several community college educators participating in this study indicated that they have long waiting lists for spaces in registered nursing programs and that students unable to enroll in them frequently enter licensed vocational nursing programs, with the hope that they can later transfer into RN programs. Programs for licensed vocational nurses and nursing assistants face a similar surplus of qualified applicants. As one study participant said, "high LVN enrollments reflect the fact that the labor market has never looked better," and some educators indicated that as many as three applicants apply for each place in an LVN program.

In 1989, the Office of Statewide Health Planning and Development, Division of Health Projects and Analysis (1989, p. 26) recommended adding new nursing programs and enlarging existing ones to meet unfilled educational needs. The following year the RN Special Advisory Committee Report to the California Legislature offered the same recommendation (1990a, p. 33). However, for this expansion to occur within the community colleges, which produce more than two-thirds of California's RNs, existing enrollment caps must be lifted. The projected future demand for nurses in California provides strong justification for suspending these enrollment restrictions.

Yet, from the perspective of individual educational institutions, lifting enrollment caps is only a partial solution to the problem and, in the long run, probably will not generate sufficient enrollment increases to meet growing demand. Nursing programs are expensive to operate and cannot be funded adequately from normal average daily attendance (ADA) revenue. At the secondary, community college, and baccalaureate levels, nursing and nursing support programs often lose money because of the low student/teacher ratios demanded by accrediting bodies and the hospitals and other facilities that provide clinical placements. Study participants responsible for registered and licensed vocational nursing programs in community colleges and various nursing support programs in a regional adult program indicated that nursing programs cost approximately twice as much as other programs in their institutions. Although some program administrators can offset these deficits with revenue generated by other health occupation programs, there is a limit on the extent to which this is economically feasible.

New Nursing Programs to Accommodate Future Demand

In addition, because the capacity of on-campus facilities and access to local clinical placements are limited, expanded enrollments in existing programs probably will be insufficient to meet personnel requirements over time. Nationwide, the U.S. Bureau of Labor Statistics ranks nursing as the third fastest growing occupation, with six-hundred thousand new positions available between 1988 and 2000 (Office of Statewide Health Planning and Development, 1989, p. 3). In the Bay Area alone, the California Employment Development Department projects a twenty-nine percent increase in the employment of registered nurses between 1987 and 1995, translating into more than ten-thousand additional jobs (Bay Area Council, 1990, p. 8). Even if temporary economic conditions reduce this growth somewhat, long-term needs will only be met by long-term planning for adequate enrollment capacities.

Thus, a number of new programs must be established in some of the twenty-two California community colleges that will be built throughout the state within the next fifteen years to accommodate an expected 552,000 new students and an increase of nearly twenty percent in the state's population (Greene, 1989). However, the heaviest financial burden associated with implementing new nursing programs are start-up costs that require significant investment funds. Based on previous experience, community college administrators argue that it will be difficult to meet these financial requirements through traditional average daily attendance (ADA) funding. Additional financial support for nursing programs from federal and/or state sources, or from education/industry partnerships, will be necessary to generate the increased enrollments required by growing demand.[6]

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[6] Federal funds currently do not support nursing education. The California Special Advisory Committee Report on the Nursing Shortage pointed out that federal funding for basic nursing education was terminated in 1983, and nursing enrollments plummeted thereafter.

Increased Financial Aid

Support for nursing students in the form of loans and grants will also be important because enrollments appear to be directly linked with the availability of financial aid. At the same time that federal subsidies for nursing programs ended in 1983, restrictions were imposed on general student loan programs. This contraction of student aid was viewed by several study participants as an additional factor contributing to declining enrollments. With continuing restrictions on financial aid and the fact that enrollments depend on its availability, the present level of financial aid for nursing students will not be sufficient to support major enrollment growth. Students planning to enroll in a registered nursing program at a California community college especially need expanded financial aid options because state nursing scholarships offered by the Office of Statewide Health Planning and Development are currently restricted to individuals pursuing baccalaureate degrees.

Expansion of grants and loans to nursing students will be particularly critical in California and in other states where substantial proportions of nursing students come from lower and lower-middle income groups.[7] In California these income groups include many minorities and immigrants who need both financial aid and work opportunities that will allow them to pursue an education while maintaining their family income. Increased financial support will be especially important if fees for community college and state university programs are raised in the future.

Programs to Increase the Availability of Nursing Faculty

Finally, establishing new nursing programs and increasing enrollments in existing ones can only be accomplished if there are sufficient numbers of nurses with master's degrees who are available and willing to fill faculty openings. To date, the availability of potential faculty has not been adequate. In fact, only six percent of nurses nationwide and in California hold graduate degrees (RN Special Advisory Committee, 1990b, p. 29). This shortage of nurses with master's degrees who are available for faculty positions has resulted, in part, from the limited availability of graduate-level education opportunities.

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[7] About two-thirds of nurses come from families with annual incomes under $40,000 (Green, 1987).

Although six schools in Northern California have master's programs in nursing,[8] they do not contribute sufficient numbers of master's-degreed nurses to the actual pool of nursing instructors. Because of the scarcity of nurses qualified for faculty positions and the higher salaries that industry frequently offers these nurses, it was not surprising that several administrators of nursing programs involved in this study faced serious faculty recruitment difficulties.

One implication of this finding is that graduate nursing programs and graduate nursing students will also need additional financial support to increase the future production of qualified nursing faculty members. Even if this pool is expanded, salary issues also must be addressed. To compete successfully with hospitals and other nonacademic settings, colleges must offer competitive faculty salaries. Consequently, findings from this study support the RN Special Advisory Committee's (1990b, p. 29) recommendation to develop strategies that will raise instructional salaries and, thereby, ensure the availability and interest of qualified nursing faculty.

Regional Planning to Ensure the Availability of Nursing Programs

The Special Advisory Committee Report on the Nursing Shortage (1990) identified increased access to nursing programs as critical to retention in the nursing field. In making this recommendation, the report emphasized the importance of providing continuing education for individuals who want to upgrade their education and positions to ensure nurse retention. Findings from this study not only support this recommendation, but also identify the labor supply implications for both students and employers of this need for greater access.

Interviews with nursing administrators throughout the Bay Area and results of the study's nursing focus group both strongly indicated that, in this geographic area, labor markets for nurses are actually "micromarkets." Specifically, because of the high cost of housing, child care responsibilities, single parenthood, or dual career situations, nurses frequently seek positions in the immediate geographic areas where they live and have completed school. Consequently, hospitals that are only fifteen or twenty miles apart can face dramatically different recruitment environments, depending on whether RN, LVN, or

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[8] These master's programs are at the University of California at San Francisco; the California State Universities at Hayward, San Jose, San Francisco, and Sonoma; and the University of San Francisco, a private institution.

CNA educational programs are located nearby. Some nurse administrators with whom we talked indicated repeatedly that while their hospital no longer even recruits unavailable LVNs or CNAs or that they face severe problems recruiting RNs, hospitals just a few miles away are more successful in recruiting because of their proximity to educational programs.

The broader implication of these micromarkets should be underscored for its impact on future nursing recruitment in the Bay Area. Data from both public and private sources (Bay Area Economic Forum, 1989) indicate that commute difficulties in the Bay Area region will worsen in the coming decade and that cost of living indices will rise. These trends may further reinforce nurses' desire not to commute or relocate and will exacerbate recruitment difficulties for health care providers that do not have access to graduates of nearby educational institutions.

Finally, even in locations where local nursing programs exist, many of them do not offer scheduling that meets the needs of working health care professionals. Several study participants indicated that they had employees who were very interested in continuing their nursing educations, but that lack of part-time programs—especially for upgrading from associate degree to baccalaureate degree nursing—discouraged this upward mobility. Our findings also indicated that a local private baccalaureate nursing program offering night and weekend instruction consistently has high enrollments even though it is relatively expensive. Clearly, flexible scheduling and part-time instruction are another aspect of access to nursing education that can have significant implications for the retention of nursing personnel who seek career advancement.

Our findings on the importance of the accessibility of nursing programs suggest that regionwide planning for program placement and developing new part-time and weekend programs might significantly affect the availability of nursing personnel. In particular, these coordinated efforts could diminish differences in the availability of nurses across geographic locations and possibly across health care sectors.

Educational Programs to Enhance Upward Mobility

The previous discussion highlighted the need for increased access to educational opportunities in nursing to ensure an adequate future personnel supply. It is important to note that both in-house and external nursing education are key to accomplish this objective. In several studies, nurses clearly indicated the importance of inservice training programs as a determinant of satisfaction with their jobs (Huey & Hartley, 1988, p. 183), and many of them have also emphasized the importance of strong hospital education and training departments in performing their jobs (CAHHS, 1988, p. 15). In addition, there is evidence of high demand for external continuing education opportunities. Large numbers of nurses and nursing support personnel advance in their careers through enrollment in educational institutions that offer certification programs and courses leading to higher degrees.

Particularly relevant to this study was the finding in other research that the availability and affordability of outside educational opportunities are significant both for ensuring adequate numbers of new entrants to all levels of the nursing occupations and for encouraging retention among employed nursing personnel. The following observations from recent research on the nursing crisis and from this study underscore the importance of this issue:

- Twenty-five percent of nearly one-thousand California nurses surveyed in 1988 indicated that career advancement and education were reasons they had previously changed jobs; this reason ranked a very close second to relocation of family unit or reducing commute distance from home to work (CAHHS, 1988, p. 17).

- Two secondary and adult education specialists participating in this study indicated that the lack of upward mobility opportunity for certified nursing assistants was a major cause of high turnover in that field. They argued that especially when individuals could not manage the cost of additional education, many CNAs moved from employer to employer to increase their salaries. The costs of this pattern to the health care industry are obvious.

- Almost all of the nursing administrators responding to our hospital survey indicated that nursing personnel at all levels frequently return to school to obtain additional degrees (although one respondent strongly disagreed with this view). In addition, they uniformly responded that their hospitals encourage employees to obtain higher degrees. Clearly, institutional support exists for these activities, and there are many role models of nurses and other health care employees who successfully achieve mobility through additional education.

- One home health agency administrator indicated that certified nursing assistants and home health aides generally did not initially select these fields with the expectation of later working toward licensed vocational or registered nursing degrees. However, once they realized the advancement and earning advantages of continued schooling, many who could afford to do so later articulated into degree programs.

- A New York City program providing stipends to lower-level health care workers found that their first choice of a career that would lead to advancement was nursing (Friedman, 1990, p. 2978). In addition, several educators participating in this study indicated that previous work experience in health care is one of the best predictors of success in nursing programs. These two observations suggest that assisting individuals already employed in health care to continue their education will help them capitalize on their knowledge and experience and may increase the number of successful nursing graduates.

Articulated programs that offer credit for previous related education serve as one of the most effective ways of creating educational support for upward mobility, and many such programs have been developed nationwide and throughout California. Some of these programs have resulted from collaborative efforts among educational institutions that train various levels of nursing personnel, while others evolved from partnerships between educational institutions and health care providers. Figure 3 illustrates the linkages among educational institutions to coordinate planning for articulated nursing education programs and the career path that is supported through these programs.

The following discussion highlights some of the major elements of articulated nursing programs that have led to their success and emphasizes some of the challenges that still need to be addressed.

Elements of Successful Programs

Throughout California the types of cross-institutional arrangements that have contributed to successfully articulated nursing programs have been diverse. However, several elements have characterized the best of these efforts.

- Planning involved the full participation of administrators and faculty from all levels of educational institutions.

- Faculty from all educational sectors worked together to develop and revise curricula.
- Credit was offered to students for all competencies achieved, and associate degree nurses were given credit for previous undergraduate work.
- Upper- and lower-division barriers were eliminated at some of the California State Universities.
- A consistent numbering system was developed and used for all nursing courses offered at both community colleges and in baccalaureate programs.

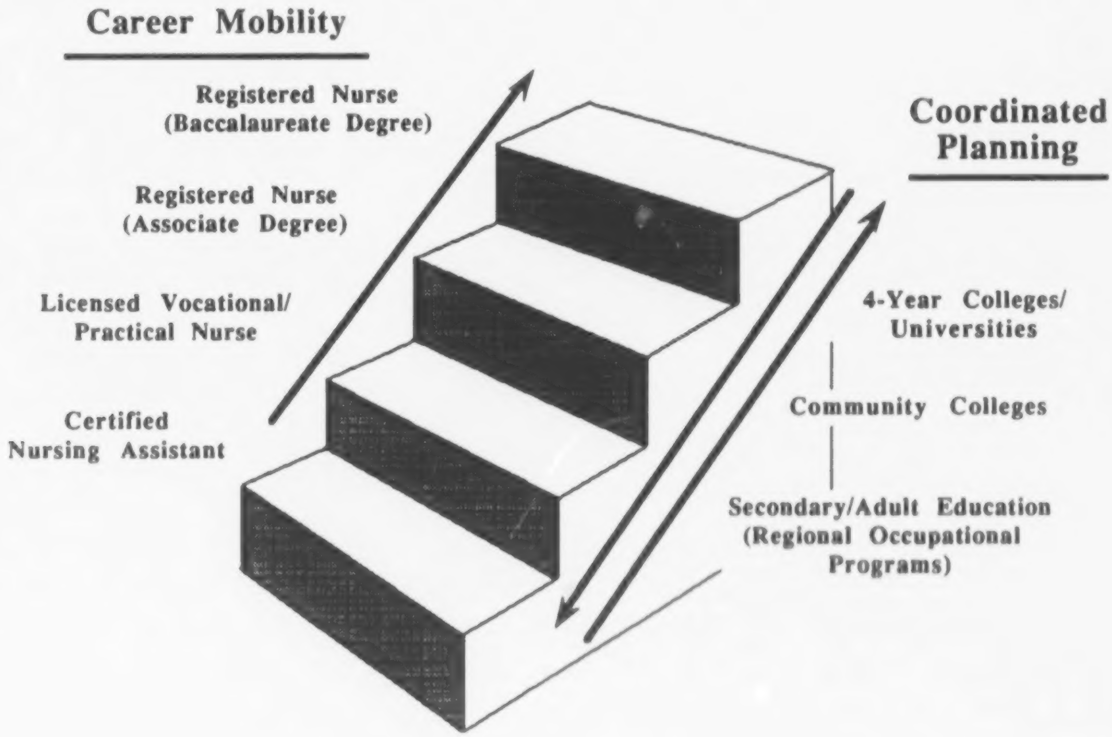
Challenges to Overcome

Although California has experienced considerable success in developing articulated programs, challenges remain. Most important among these is the need for more consistent standards across programs in order to establish statewide programs for articulation. For example, community college LVN programs now vary a great deal in their required courses, program duration, curriculum content, and outcome skills. These differences apparently have relatively little impact on variation in job performance because surveys of health care providers that hire LVNs show a high level of satisfaction with their job performance throughout the state (Zylinski & McMahon, 1990). Nevertheless, to establish articulation policies and to ensure high levels of success among LVN students articulating into RN programs, it is important that a common set of outcome standards be established for all community college LVN programs.

A similar situation exists in terms of programs for CNAs offered through the California State Department of Education. These programs do have consistent minimum standards. However, actual competencies achieved by students are highly variable across different programs and can have an important impact on students' success rates in articulated licensed vocation or registered nursing programs.

A second challenge centers on the need for additional funding to support articulated baccalaureate nursing programs. Specifically, the first two years of nursing education are much less expensive for institutions to provide and are used to subsidize the more expensive second two years. This is because of the higher cost of clinical training in upper-division courses that require low student/teacher ratios. As a result, some state

Figure 3
Coordinated Planning for Articulated Nursing Education Programs


Career Mobility
Registered Nurse (Baccalaureate Degree)
Registered Nurse (Associate Degree)
Licensed Vocational/ Practical Nurse
Certified Nursing Assistant
Coordinated Planning
4-Year Colleges/ Universities
Community Colleges
Secondary/Adult Education (Regional Occupational Programs)

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universities have been reluctant to expand their upper-division enrollments without a commensurate increase in the number of lower-division nursing students.

The Debate over Requiring Baccalaureate Degrees for Entry into Nursing Practice

A study focusing on education policy and how it relates to the future supply of nurses would not be complete without a discussion of the debate on requiring baccalaureate degrees for entry into nursing practice. This section addresses that question by presenting study findings based on interviews, focus groups, and survey responses with nursing administrators and educators and linking them to observations from previous research.

Recommendations that a B.S. degree be required for entry-level nursing practice have been made for many years, although significant differences of opinion have been voiced on this issue throughout the nursing profession. The California Society for Nursing Service Administrators, for example, has recommended that a gradual transition be made toward requiring baccalaureate degrees (CAHHS, 1988, Appendix D). In contrast, the Organization of Nurse Executives (ONE) supports articulated nursing programs as being the most effective method of increasing both the supply of registered nurses and their opportunities for additional skills development. Findings from this study support this latter view because of the negative impact that a baccalaureate degree requirement would have on the supply of California RNs and because of the generally positive evaluations we gathered of the job performance among associate degree nurses.

In California, about two-thirds of registered nurses are now completing their education in associate degree nursing (ADN) programs (RN Special Advisory Committee, 1990b). Objective indicators suggest that at least among entry-level nurses, ADNs are as equally well qualified as their BSN colleagues. In fact, throughout the state and nationwide, diploma and associate degree nurses achieve equivalent or higher pass rates on licensing examinations than do baccalaureate-trained nurses (Friedman, 1990, p. 2981; National Council on Licensure Examination for Registered Nurses, 1990). Some nursing educators account for these lower pass rates by arguing that BSNs are not trained with the illness model that is reflected in the licensing examination, and they further argue that BSNs provide better patient care. However, this contradicts the statements of some analysts that employers have expressed growing dissatisfaction with baccalaureate nursing graduates (Friedman, 1990, p. 2981).

This study revealed sharp differences of opinion on this issue. On the one hand, some of the respondents restated Friedman's view, indicating that newly graduated BSNs do not have the necessary clinical experience when they first begin practice, whereas ADNs frequently do. Those administrators gave higher marks to the ADNs at the entry level. In contrast, one nursing administrator with over a dozen years of administrative experience felt that well-trained LVNs are nearly equivalent in their technical skills to ADNs, but that BSNs demonstrate clear superiority in leadership and decision-making skills. Moreover, she was not particularly satisfied with the training received by ADNs.

Despite these few divergent views, the majority of respondents who were interviewed for this study or completed the surveys felt that nurses with associate and baccalaureate degrees were about equivalent in their entry-level skills and abilities. However, most nursing administrators also agreed that BSNs later outperformed ADNs when nurses were called upon to exercise leadership and independent judgment. Yet, there was an important qualifier to this last statement. Several respondents indicated that it was actually very difficult to compare BSNs and ADNs later in their careers because so many ADNs who aspire to leadership, supervisory, or specialty positions returned to school for their baccalaureate degrees.

These observations by nursing administrators suggest that education policy directed at creating an adequate supply of nurses must achieve two goals: (1) provide appropriate training for entry-level positions and (2) ensure the availability of opportunities for higher-level skills development and career advancement. These two are closely related objectives, but they lead to different and complementary strategies.

Multiple Entry Points to the Nursing Career Ladder

These analyses strongly suggest that maintaining current multiple-entry points for registered nurses through both associate and baccalaureate programs will be necessary to prepare sufficient numbers of entry-level nurses in the future. This view of the multiple-entry career should be a broad one that also includes entry through nursing support occupations and articulated educational programs that include all levels of nursing occupations.

The following demographic projections for California and the demographic history of the nursing population provide the rationale for this statement.

- Currently, the most rapidly growing population groups in the state are minorities and immigrants, and that will continue to be so in later years.

- Nursing has traditionally drawn students from lower and lower-middle socioeconomic groups; the field will likely continue to do so; and these groups will be disproportionately composed of minority and immigrant groups in the future.

- Members of these socioeconomic groups disproportionately begin their postsecondary educations in adult education programs or in the community college system where they have more financial and geographic access to educational opportunities.

- Because of their costs, entrance requirements, and cultural factors that limit students' aspirations for four-year degrees, baccalaureate nursing programs tend not to attract members of lower-income groups.

Taken together, these trends suggest a clear need to ensure that large numbers of students have access to nursing programs throughout several levels of the educational system. They also highlight the importance of educational programs in nursing support occupations as a way of developing pools of motivated and experienced potential nursing school applicants.

Expanded Opportunities for Articulated Education

Expanding articulated education programs will support the nursing profession's need to develop more complex skills, while also encouraging individual nurses' efforts to advance their careers.

- This study and others have indicated that upward career mobility is very important to nursing support personnel, who have already demonstrated that they participate in articulated education programs when these opportunities are available and affordable.

- Nursing administrators indicated that many associate degree nurses gain the higher-level skills necessary for performing their jobs by returning to school for baccalaureate degrees. Consequently, the needs of health care providers for supervisory and specialty personnel can be supported with articulated education programs that encourage upward mobility through obtaining B.S. and M.S. degrees in nursing.

Improved Nursing Productivity through Leadership and Communication Skills Education

Experts participating in this study gave generally high marks to the technical training received by new graduates from programs at all levels of the nursing profession. Especially among baccalaureate and associate degree RNs, but also among LVNs, knowledge of basic sciences among entry-level personnel received the highest evaluations. Knowledge of nursing theory and of nursing assessment ranked second and third. These areas were generally positively evaluated, although some open-ended responses suggested that new RNs often were lacking in assessment skills.

In contrast, study participants had very mixed opinions about the nontechnical skills of entry-level employees. Leadership skills received the most negative assessments, with nine of the eleven respondents from surveyed hospitals indicating that baccalaureate and associate degree nurses and licensed vocational nurses did not have adequate entry-level leadership skills. About one-half of these respondents also indicated that RNs and/or LVNs lacked communications skills.

In addition, many administrators who were interviewed and respondents who answered open-ended questions indicated that entry-level employees lacked organization, time-management, and priority-setting skills. While the inadequacy of these skills was mentioned throughout all levels of the nursing occupations, it was mentioned most frequently for nursing assistants. These findings about skills deficiencies are especially significant in light of other findings from this study and from related research indicating that across all nursing job categories, communication and organizational/time-management skills were "one of the three most important skills for entry-level employees."[9]

The Need for Communication and Leadership Skills

As a result of continuing efforts to control rising health care costs and the demands of highly specialized nursing care for acutely ill patients, developing communication and leadership skills may become even more important in the future. Recent trends and projections suggest that at least in the short-run, growing numbers of hospitals will be organizing patient care around a team nursing model. For this approach to work effectively, all team members must have excellent communication skills and understand the principles of teamwork and leadership.

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[9] For RNs, assessment was very frequently indicated as an important entry-level skill, and on several surveys, assessment also was mentioned as important for LVNs.

The importance of these skills has been recognized in other studies and is clearly supported by this research. For example, Napa Valley College's Comparative Study of Vocational Nursing Curriculum and Employer Requirements (Zylinski & McMahon, 1990, p. 9) identified the curricular modifications that were most desired by 118 agencies employing LVNs throughout California. These agencies indicated that the most important skill area requiring further development was in team leading, leadership, and organizational skills. As a result of this finding, the Napa Valley College report recommended strengthening leadership or managed care components of LVN programs.

There are strong arguments that support a similar recommendation for curriculum review in registered nursing programs. For example, a 1986 study by the California Association of Hospitals and Health Systems (White & Arstein-Kerslake, 1986) indicated that lack of participation in decision-making was a significant problem in recruiting RNs. Their 1988 report stated that many hospitals responded to this problem by establishing forms of participatory management. Yet for nurses to participate effectively in decision-making processes, they must have well-developed communication and leadership skills, which many nursing administrators in this study indicated are lacking.

Finally, the RN Special Advisory Committee Report on the Nursing Shortage (1990a) offered several strategies for increasing the supply of nurses that focus on more and better communication between nurses and other health care professionals. Specifically, the Committee recommended implementing the following strategies for the retention and career development of experienced nurses:

- Employers of nurses should develop and implement methods, structures,and networks to enhance nurse/physician communication.
- Employers of nurses should promote clinical involvement in decision-making by maximizing communication and cooperation between clinical nurses, nurse managers, administrators, and physicians.

To effectively implement these strategies, all health care personnel involved in these efforts will need to demonstrate well-developed communication skills and strong leadership abilities.

MEDICAL IMAGING OCCUPATIONS

Introduction

This section presents findings on the changing skill requirements in six medical imaging occupations. It begins with an overview of the changing work environments and job responsibilities that have recently emerged in the imaging fields. The second unit describes current requirements in the areas of education, licensing, and certification. The third unit describes and analyzes the data that were collected from surveys, interviews, and focus groups. It also identifies important skills needed to enter each of the medical imaging professions; the skills that have become more important in recent years; and the skills that are necessary to advance in these fields. The final unit of this section addresses issues of supply and demand in the labor market, including the ability of existing educational institutions to meet present and future demand for imaging professionals in the Bay Area.

Occupational Overview

The medical imaging field encompasses a range of occupations that primarily use noninvasive techniques to produce internal images of the body and to treat disease (Bureau of Labor Statistics, 1988, p. 175). Imaging professionals operate in a variety of settings, including hospitals, free-standing clinics, HMOs, and outpatient clinics, where they provide medical services to patients with virtually all kinds of internal disorders. All of these occupations emerged from x-ray technology and evolved from using radiation to create a simple internal body image to methods as varied as radionuclides, sound waves, and magnetic fields to "see" internal organs, bones, and tissues.

Imaging occupations range from EKG technicians, who are generally restricted to performing tests that monitor the heart's electrical action, to MRI technologists, who use magnetic resonance to create images of almost all parts of the body. Other imaging professions include diagnostic radiologic technologists, radiation therapy technologists, nuclear medicine technologists, ultrasound technologists, audiometrists, technologists, cardiopulmonary technologists, cardiovascular technologists, and electroencephalographic (EEG) technologists (Bureau of Labor Statistics, 1988, p. 178; Employment and Training Administration, 1977, p. 62).

From these occupations we selected six to be included in this study: EKG technician, nuclear medicine technologist, MRI technologist, ultrasound technologist, diagnostic radiologic technologist, and radiation therapy technologist. Because creating an image of the same body part can be accomplished by using various technologies, the duties of these professions often overlap. For example, a person with a suspected tumor might have an x-ray taken by a diagnostic radiologist or ingest a radionuclide administered by a nuclear medicine technologist. Similarly, either ultrasound or magnetic resonance could be used to produce images of a moving heart, and either or both of these diagnostic methods could be used on the same patient.

All six medical imaging occupations meet the two selection criteria developed for this study: There are existing and projected personnel shortages in all six fields, and there have been and will continue to be major changes in the occupational skills that present and future professionals need. In addition, we selected these occupations because a substantial number of people have worked in more than one of these imaging occupations throughout their professional careers.

Changing Job Responsibilities

Like so many occupations in the health care field, virtually all of the medical imaging occupations have experienced some degree of change in job responsibilities over the past five to ten years. In some fields such as MRI, new technologies led to new jobs that had never existed before. In other cases, like diagnostic radiologic technology and ultrasound, new job responsibilities related to clinic and business management emerged as federal medical reimbursement formulas fostered the growth of free-standing imaging facilities that operated independent of hospitals. In many imaging occupations, shortages of skilled staff and cost control efforts mandated increased productivity based on broader technical knowledge and higher skill levels. This section provides an overview of the most important shifts in job responsibilities that have occurred in the medical imaging field.

EKG Technicians

The entry-level responsibilities of EKG technicians have not changed dramatically over the past fifteen years. Their basic responsibilities continue to be attaching electrodes to a patient's body and recording the heart's electrical action; preparing the EKG readout for the cardiologist or other physician to review; and performing various support duties such as typing and basic equipment maintenance (Bureau of Labor Statistics, 1988, p. 165).

However, many technicians are now expected to perform a greater range of tasks that go beyond knowing how to administer a resting EKG test and include the use of computerized technology. For example, many employers expect technicians to be able to perform tasks such as Holter monitoring, which involves attaching an ambulatory device that monitors the patient twenty-four hours a day, and stress testing, which requires recording the EKG while the patient exercises (Bureau of Labor Statistics, 1988, p. 166). In more advanced settings, the ability to perform echocardiography, a procedure in which the technician monitors a patient's heart using ultrasound technology, is also important.

As EKG technology has become more computerized and sophisticated over the past fifteen years, the role of the entry-level EKG technician has become simpler due to the computerization of major tasks that were previously performed by hand. For example, an EKG test that used to take fifteen minutes can now be completed in five minutes because increased computerization has eliminated the need for the technician to mount three separate backboards for the physician to read. Computerization has also eliminated much of the clerical work once required of EKG technicians to document test results.

Nuclear Medicine Technologists

Like EKG technicians, the fundamental job responsibilities of nuclear medicine technologists have not changed dramatically in recent years. However, increasing government regulation and technological advancements have altered the profession by increasing both the general knowledge and technical skills necessary to perform the job. Today the occupation operates under the same essential principles as it did when radionuclides were discovered after World War II, with technologists continuing to administer radionuclides to patients, take images of the radiation inside the body, perform clinical lab studies, and perform a limited amount of therapy to treat such illnesses as thyroid disease and hemostatic cancer (Bureau of Labor Statistics, 1988, p. 173).

However, computer enhancement within the past fifteen years has played a major role in improving image quality and increasing the knowledge available to the technologist. One nuclear medicine technologist interviewed for this study said that ten years ago images were crude compared with present ones because today's computers can enhance images through digital acquisition techniques. The interviewee also said that because of these capabilities, technologists now use computers extensively. As a result, technologists need more advanced skills in software management and greater knowledge of mathematics to understand and apply complex information.

At the same time, government regulation of nuclear medicine has continued to grow, increasing the knowledge that technologists must have of regulatory areas and radioactive materials management. States have also increased their regulation of nuclear medicine technologists. For example, California began licensing nuclear medicine technologists in 1989, and now requires that they pass a licensing exam and complete more extensive paperwork documenting radiation use and disposal to satisfy federal and state regulatory requirements. One technologist who participated in this study indicated that radiation compliance standards probably quadrupled between 1985 and 1990, and that the amount of documentation now required is "extraordinary."

Another major change in the field is that there has been some reduction in the diagnostic use of nuclear medicine as new imaging technologies have emerged. While the total workload of a typical nuclear medicine technologist probably has not decreased over the past ten years, nuclear medicine has not grown as rapidly as other imaging technologies such as ultrasound or magnetic resonance imaging, since many imaging procedures that formerly involved nuclear medicine are now performed using nonradioactive techniques. For instance, nuclear medicine technologists are performing fewer brain scans than previously because of the increasing efficacy of CT and MRI.

Nuclear medicine will continue to be a highly useful diagnostic specialty, but only in limited scanning procedures where nonradioactive imaging techniques are less effective or cost-efficient such as in bone and heart scans. However, diagnostics is only one application of nuclear medicine technology. Results of current and future research could produce significant changes in the job responsibilities of nuclear medicine technologists by expanding the therapeutic uses of this technology.

Diagnostic Radiologic Technologists

For radiologic technologists, a gradual shift has taken place toward expanded job responsibilities and increased diagnostic latitude. Radiologic technologists (also known as x-ray technicians) have been practicing longer than any of the other imaging professionals included in this study, and x-ray is in many respects the technologic forerunner of ultrasound, magnetic resonance imaging, and nuclear medicine. The original practice of positioning a patient under an x-ray machine, shooting a beam of radiation through the body, and recording the image produced by this radiation forms the foundation of the x-ray technologist's job. However, computerization and the advent of nonradioactive imaging procedures have changed the nature of radiography by making it more complex, while at the same time limiting its possible applications, as newer technologies begin to take over imaging functions once performed exclusively with x-ray.

In recent years computerization has changed the nature of the occupation, as it has in all imaging occupations, by improving the clarity of images. Technologists are now able to produce images of soft tissues and organs that until recently could only be examined through invasive procedures (Bureau of Labor Statistics, 1988, p. 175). Because of these advances, computer skills and a broader knowledge of human anatomy have become more important.

At the same time, the general improvement in medical technology has limited the applicability of x-ray technology. While computers expanded the capabilities of x-ray technology, the invention of CT, MRI, and ultrasound limited its practical scope because with these new technologies imaging procedures could be performed more effectively and/or more safely. With the invention and subsequent improvement of these imaging technologies, x-ray technicians are not as likely to perform procedures such as bone scans, brain scans, or prenatal studies.

Radiation Therapy Technologists

Radiation therapy technologists have also experienced a progressive improvement in their technology, leading to a gradual increase in both the cognitive abilities and general knowledge necessary to perform their jobs. Based on the findings from this study, the two skills areas that changed the most in this field were the increased level of computer knowledge required and the ability to delegate less technical tasks to other health care workers and oversee their activities.

Radiation therapy is an offshoot of diagnostic radiology. Although the basic technology is similar to that of diagnostic radiology, the purpose of radiation therapy is to treat cancers within the body that have already been detected. The radiation therapist administers radiation treatments to patients using a plan designed by a dosimetrist and also treats the same patients on a weekly basis (Bureau of Labor Statistics, 1988, p. 176). The therapist's job usually involves positioning the patient correctly, administering radiation treatments, and ensuring that the radiation does not hit an unintended part of the body. As a result of the new computer technologies, the precision with which radiation treatments can be administered has changed. Therefore, therapists must have a firm understanding of computers in order to perform their job effectively.

The importance of new technology was underscored by the comments of one technologist interviewed for this study who indicated that radiation therapy technologists must now be computer literate as soon as they begin practicing. Fifteen years ago computers only played a small part in the therapist's work; however, today the combination of computers and more sophisticated machinery makes it necessary for the radiation therapist to have extensive training in equipment use and computer technology.

In contrast to diagnostic radiologic technology, radiation therapists have not experienced decreasing applications of their work due to the development of alternative technologies. Instead, according to one of our respondents, the shortage of trained radiation therapy technologists created a growing demand and a situation where medical personnel from other fields were recruited to work with trained radiation therapists in order to maintain minimum staffing requirements.

Unlike diagnostic work, radiation therapy is not an area that can be replaced by other nonradioactive technologies, since cancers cannot be treated with magnetic resonance imaging or ultrasound. Radiation therapy, although considered to be a small field by diagnostic radiology standards (with an estimated eighteen thousand diagnostic versus five hundred therapy technologists in California), will continue to grow as a field separate from diagnostic radiography.

Ultrasound Technologists

Ultrasound technology has been used in medical diagnosis since the early 1970s, when hospitals first began buying ultrasound equipment and training people to operate it.

Initially, training in ultrasound technology, also called sonography, consisted of one- or two-week in-house hospital courses using equipment considered crude by today's standards. One sonographer interviewed for this study said that the old images resembled weather satellite photo maps consisting of black or white dots on a screen. These images have now evolved to the point where the dots are displayed in various shades of grey, presenting the technologist with much more extensive and useful information. Consequently, the sonographer must now be able to interpret images that were not even observable with the equipment available fifteen years ago. This, in turn, has increased the uses of ultrasound technology and the technologist's required level of basic knowledge and interpretive skills in the areas of pathology, anatomy, and physiology.

One of the newest imaging technologies, ultrasound quickly became the modality of choice for certain diagnostic imaging procedures. This was especially true for cardiovascular and prenatal studies, where it is desirable to produce a moving image without using radiation (Bureau of Labor Statistics, 1988, p. 176). The actual duties of the sonographer involve preparing the patient with a gel or some other type of transmitting agent, recording the images necessary with a hand-held transducer, making sure that there is a hard copy film for a physician to review at the end of the study, and then discussing the results with the physician as needed (Bureau of Labor Statistics, 1988, p. 62). This process normally takes between thirty and sixty minutes and is repeated many times in the course of the sonographer's day.

Sonographers also have a great deal of latitude when performing their scans, and a high level of skill is required in interpreting the results. One technologist interviewed for this study said, "The sonographer who performs the study can have the ability to make a tumor where none exists, or miss a tumor where one exists, and that is very dependent on their skill level." Because the technologist uses a hand-held transducer to perform the study, positioning is important, and poor positioning of the transducer could produce misleading results. Although ultrasound is a relatively new field, significant improvements in technology have increased the amount of basic science and technical knowledge a sonographer must acquire.

Magnetic Resonance Imaging Technologist

MRI technologist is the newest medical imaging occupation included in this study, having existed commercially for only about five years. The changes described for the other professions in this chapter are not analogous to those occurring in MRI because the field is still in its infancy. For example, MRI technologists require no certification and are not subject to state or federal licensing. The profession will probably demand an increase in knowledge for practitioners, but specific changes in the occupation cannot be predicted with confidence.

Although somewhat more interpretive, MRI technologists' basic duties are not greatly different from those of the other imaging technologists. They include taking a brief patient history, positioning patients properly, determining the appropriate scan(s) to be performed, interpreting the information that the scans provide, communicating this information to the physician, and consulting with the physician as necessary. However, MRI is also a much more advanced technology than those previously discussed, and it will continue to be much more powerful diagnostically as its capabilities are better understood.

MRI offers as much or more latitude to technologists than do other modalities, and therefore demands that they work independently in planning and interpreting the scans. One technologist said that compared with other imaging methods, MRI technologists can try an enormous variety of parameters, some of which are clinically useful and others not. As the capabilities of magnetic resonance are fully explored, MRI has the potential to create new advances in imaging technology. This improved technology will inevitably lead to a more complex role for MRI technologists.

The Work Environment in Imaging Occupations

The work and organizational environments in which imaging occupations are practiced have had various effects on both the technical and nontechnical job duties performed in these occupations and the skills, knowledge, and abilities required to perform those duties. Traditionally, nearly all medical imaging professionals practiced in hospital settings where they interacted frequently with physicians. Although not all imaging occupations were equally affected by these trends, several factors emerged in recent years that led to the development of autonomous facilities that provide imaging services to physicians from one or several hospitals. These included the following:

- The extremely high cost of new technologies, which prohibited some hospitals from purchasing equipment for their exclusive use and led to shared use of imaging services offered by independent imaging centers.

- Federal medical reimbursement restrictions, which encouraged hospitals to contain costs by using outside services offered through independent providers.

- Technological advances, which fostered the development of mobile imaging units that are used to serve patients in a wider geographic area.

EKG Technicians

EKG technicians traditionally worked in hospitals, where they provided diagnostic testing at the request of the physician. Recently, however, there has been a slow but perceptible movement of these services from hospitals into settings as diverse as cardiologist's offices, cardiac rehabilitation centers, HMOs, and clinics (Bureau of Labor Statistics, 1988, p. 166). For example, according to a study conducted by the Bay Area Council and the California Employment Development Department (Bay Area Council, 1990), almost seventy-eight percent of Bay Area EKG technicians worked in hospitals in 1987, and it is predicted that this percentage will decrease to seventy-two percent by 1995.

Nuclear Medicine Technologists

Nuclear medicine technologists have traditionally worked in hospitals due to the size and sophistication of their equipment, as well as strict requirements for handling radioactive materials mandated in this occupational environment. According to the Department of Labor Handbook for 1988, about ninety percent of active nuclear medicine technologists worked in hospitals, with the balance working in medical labs, physician's offices, and outpatient clinics (Bureau of Labor Statistics, 1988, p. 171).

A Massachusetts study of imaging professionals produced similar findings and indicated that ninety percent of the nuclear medicine technologists responding to a survey worked in hospitals, with the remainder employed in private offices or clinics (American Healthcare Radiology Administrators [AHRA], 1989, p. 7). However, in some geographic areas equipment complexity and materials handling regulations have not hindered many nuclear medicine technologists from moving out of hospitals. A 1990 study conducted by the Bay Area Council and the California Employment Development Department indicated that only sixty-four percent of the nuclear medicine technologists working in the Bay Area were employed primarily by hospitals, with this percentage predicted to fall to about sixty percent by 1995.

Diagnostic Radiologic Technologists and Radiation Therapy Technologists

The same trend toward growing employment in nonhospital settings occurred within the two categories of radiologic technologists—diagnostic radiologic technologists and radiation therapy technologists. In 1988, the Bureau of Labor Statistics estimated that seventy-five percent of radiation technologists were working in hospitals (p. 176), with the remaining twenty-five percent working in HMOs, clinics, physician's offices, and diagnostic imaging centers. Similarly, the Bay Area Council found that in the San Francisco Bay Area only fifty-three percent of all radiologic technologists were working in hospitals, and that number was predicted to fall to around fifty percent in 1995. A third estimate based on data from the Summit on Manpower examined diagnostic and therapy technologists separately. That study found that while ninety percent of therapy technologists worked in hospitals, only sixty-three percent of diagnostic technologists did so (AHRA, 1989, p. 7).

Although these percentages vary widely, possibly reflecting major geographic differences, all sources agree that within the next ten years, job growth for diagnostic radiologic technologists will occur primarily in nonhospital settings such as outpatient clinics or free-standing imaging centers. This trend reflects several influences, including increased competition for patients, a shift toward outpatient care, and technological advances, like remote transmission of x-rays, that permit procedures to be performed outside of the hospital setting (Bureau of Labor Statistics, 1988, p. 177).

Ultrasound Technologists

Ultrasound technologists, like radiologic technologists, also began moving their practices from hospitals into various independent outpatient settings. However, despite recent growth, ultrasound remains a numerically small subspecialty within the imaging field, and consequently, only small numbers of ultrasound technologists practice either in hospitals or other facilities. Nevertheless, there is little doubt that the same kinds of cost control factors affecting diagnostic radiologists will also influence where ultrasound technologists work, and will create larger numbers of independent ultrasound clinics.

There is some evidence that this shift has already started to occur. For example, in a recently completed Massachusetts study of imaging professions, lower percentages of sonographers were already found to be working in hospitals (58%) than were nuclear medicine technologists, radiation therapy technologists, and diagnostic radiologic technologists (90%, 90%, and 63%, respectively) (AHRA, 1989, p. 7).

Magnetic Resonance Imaging Technologists

Because MRI is a new profession, it has not been studied as extensively as the others discussed in this chapter. However, anecdotal evidence suggests that the MRI field may be unique because this technology was first developed for commercial use at roughly the same time that acute care hospitals were beginning to face severe cost constraints in the early 1980s. With costs averaging between $1 million and $2 million dollars per machine, MRI technology is an extremely large investment for a hospital to make. Thus, it is not surprising that the percentages of MRI technologists who worked exclusively in hospitals did not match those of other imaging professionals during the formative years of their fields. Moreover, evidence from this and other studies indicates that this trend will probably continue into the future.

Taken together, data on the medical imaging occupations indicate that to greater or lesser degrees, all of these occupations experienced important shifts in the location of practice, with increasing numbers of professionals working in independent facilities staffed largely by other professionals in their same field. However, another even more recent phenomenon has been the emergence of facilities that offer a range of different imaging services, rather than just a single modality.

One example of this new type of setting is the $8 million comprehensive cancer clinic under construction in Berkeley, California, a joint venture between Alta Bates-Herrick Hospital and Salick Health Care, Inc. (Kling, 1990, p. 5). This center will serve as a comprehensive cancer center for the San Francisco Bay Area and will include MRI, CT, and a variety of laboratories. This center may signal the future direction of medical imaging in which large, comprehensive, free-standing clinics operate either separately from hospitals or autonomously within them.

Education and Certification Requirements

Although not all of the imaging occupations are currently licensed, both professionals within these occupations and governmental agencies have pressed for stricter standards and increased regulation of practice. Respondents participating in this study almost uniformly indicated that, at least in California, nearly all occupations lacking current licensing requirements probably will require licensure in the next few years. This unit first addresses education and certification requirements in those medical imaging occupations where licensing requirements currently exist (i.e., nuclear medicine and diagnostic and therapeutic radiology. Next, those occupations that do not have licensing requirements (i.e., EKG technicians, ultrasound technologists, and MRI technologists) are discussed.

Diagnostic and Therapeutic Radiologic Credentialing

Diagnostic radiologic technologists are currently licensed in about one-half of the states in the country (American Registry of Radiologic Technologists [ARRT], 1990, p. 9). This is a substantial increase over 1987, when only sixteen states required radiologic technologists to be licensed, and only eleven states required licensure for radiation therapists (Bureau of Labor Statistics, 1988, p. 177). The trend in radiologic technology is clearly in the direction of greater state supervision. California is one of the states requiring that all radiologic technologists, diagnostic and therapeutic, possess a current certificate to practice in the state.

Diagnostic Radiologic Technologists

The ARRT (1990) was founded in 1922 and incorporated in 1936, making it the oldest professional organization serving medical imaging technologists (p. 5). The organization works closely with states like California to establish licensing standards for diagnostic technologists. Qualifying for a license as a Certified Radiologic Technologist is a two-step process: applicants must first show proof that they have completed an approved educational program, and then they must pass either a complete state licensing exam or a portion of the state exam plus earn a certificate of registry from the ARRT. In addition, technologists using fluoroscopy are required to obtain a separate fluoroscopy license from the state.

In order to apply for a California license, an applicant must have completed either a program in a California-approved school of radiologic technology or an out-of-state or foreign program recognized by California. The Joint Review Committee on Education in Radiologic Technology (a committee within Committee on Allied Health Education and Accreditation [CAHEA]) is responsible for reviewing educational programs throughout the country. The basic requirements set by California (California State Department of Health

Services, 1985, p. 588.9) specify the following five areas of instruction as necessary for students to enter the profession:

1. 500 hours of formal classroom instruction;
2. 50 hours of general radiographic laboratory;
3. 75 hours of positioning laboratory;
4. 25 hours of radiation protection laboratory; and
5. 1,850 hours of supervised clinical education.

In California, the diagnostic licensing exam includes two parts. Every applicant must take Part A on radiation protection, but those applicants who fulfill three qualifications are exempt from having to take Part B on radiologic technology. These qualifications are (1) a copy of an ARRT certificate in diagnostic radiology taken not more than five years before the date of application; (2) proof of employment as a diagnostic radiologic technologist for at least six months within the past five years; and (3) a raw score of at least seventy on the ARRT administered exam. If applicants do not meet these three criteria, then they must take both parts of the exam (California State Department of Health Services, 1985). California also issues licenses for limited permit x-ray technicians requiring one-hundred hours of classroom instruction in the specified area.

In addition, a fluoroscopy permit is necessary for those who position the patient, position fluoroscopy equipment, or select exposure factors. In order to qualify, an applicant must complete a minimum of forty-one hours of classroom instruction combined with fifteen hours of laboratory instruction at a state-approved school and must pass a state exam covering the use of fluoroscopy equipment and fluoroscopy radiation protection and safety (California State Department of Health Services, 1985).

Radiation Therapy Technologists

In 1962, the ARRT (1990) recognized radiation therapy as its own specialty within radiologic technology and instituted a separate certification exam (p. 5). The state of California also recognizes the difference between these two disciplines and offers a separate license as well as separate educational standards for this occupation. The basic education requirements for radiation therapy technologists are similar to those for diagnostic technologists, except for specific curriculum requirements including

1. 455 hours of classroom instruction;
2. 15 hours of general radiographic laboratory;
3. 60 hours of physics and radiation protection laboratory;
4. 75 hours of radiotherapy laboratory; and
5. 1,500 hours of supervised clinical education (California State Department of Health Services, 1985, p. 588.11).

The licensing requirements for radiation therapy and diagnostic technology are also similar. However, the major difference is that an applicant must pass the therapy exam and possess a Radiologic Technologist-Therapy RT(T)(ARRT) instead of an Radiologic Technologist, RT(R)(ARRT) certification from the ARRT in order to avoid taking the second part of the licensing exam. All other requirements are the same, including the need for a fluoroscopy permit if fluoroscopy is performed as part of the job.

Nuclear Medicine Technologist Credentialing

California began licensing nuclear medicine technologists for the first time in 1989. According to the U.S. Department of Labor, seven states licensed nuclear medicine technologists in 1987, and eight states did so in 1990 (Nuclear Medicine Technology Certification Board, 1987).

The minimum education requirements outlined by California for nuclear medicine technologists do not contain minimum hourly requirements, as they do for the radiologic occupations. Instead, they identify specific areas of study as mandatory to apply for a license including

- College-level study in twenty areas of radiation, science, and general education;
- Completion of college-level study in six areas of lab instruction[10];
- Completion of fifty *in vitro* tests and ten oral administrations of radioactive material;
- Completion of twelve different nuclear medicine imaging and lab procedures;

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[10] The six areas are collimators, survey instruments, gamma ray spectrometry, nuclear generators and dose calibration, preparation of radioactive material, and radioactive material waste handling procedures.

- Ten administrations of radioactive material to human beings for the purpose of performing nuclear medicine procedures; and
- Ten withdrawals of blood samples for *in vitro* tests.

In 1962, the ARRT began administering separate registry exams for nuclear medicine technologists and radiation therapists, and today it is one of three national registries that certify technologists in this area. The other agency that certifies technologists is the NMTCB and American Society of Clinical Pathologists (ASCP). The licensing procedure to become a Certified Nuclear Medicine Technologist differs from that for radiologic technologists because successful completion of the ARRT or Nuclear Medicine Technology Certification Board (NMTCB) registry exams exempts the individual from having to take any state-administered test. In order to practice in California, the applicant has three options:

1. Qualify for and pass the NMTCB or ARRT exam in nuclear medicine technology and receive both the state of California comprehensive certificate and a nationally recognized comprehensive certificate.
2. Qualify for and pass the state administered exam in all areas and receive a comprehensive certificate valid only in California.
3. Qualify for and pass a state administered exam that is valid only in California and only for limited procedures.

In addition, California allows current holders of ASCP certificates to obtain a state license, but requires new entrants to take the state administered exam through the ARRT or the NMTCB.

Electrocardiograph (EKG) Technician Credentialing

EKG technicians are not currently licensed, and much of the knowledge learned by technicians is acquired from on-the-job experience. However, survey results from this study indicated that employers may demand that technicians have a certificate of completion from an EKG training course and a cardiopulmonary resuscitation (CPR) certificate.

Although not required, credentials are available from the Cardiovascular Credentialing International (CCI) to EKG technicians who want to record an upgrading in their skills and abilities in three germane areas: Holter monitoring, stress testing, and echocardiography. CCI offers a certificate of completion credential in Holter monitoring, a Certified Cardiographic Technician (CCT) certificate in Holter monitoring and stress testing, and a Registered Cardiovascular Technician (RCVT) certificate if the applicant shows proficiency in Holter monitoring, stress testing, echocardiography, and Doppler (CCI, 1990). These credentials are not required by any licensing agency, but a credential helps assure an employer that a certain skill level has been achieved by the technician beyond the basics of EKG.

Diagnostic Ultrasound Technologist Credentialing

Ultrasound also is not a licensed occupation in the state of California, and until recently it appears that no state, with the possible exception of Utah, has licensed ultrasound technologists. Because no radiation is involved, ultrasound is perceived as being safer than the nuclear or radiologic occupations, and is therefore less likely to be licensed in the foreseeable future. Even though they are not licensed, sonographers have had the option of obtaining national credentials since 1975 (American Registry of Diagnostic Medical Sonographers [ARDMS], 1991).

The American Registry of Diagnostic Medical Sonographers (ARDMS) offers three different credentials to sonographers, which include a comprehensive certificate and two subspecialty certificates within ultrasound. The three credentials are Registered Diagnostic Medical Sonographer, Registered Diagnostic Cardiac Sonographer, and Registered Vascular Technologist.

Hospital-based survey respondents in this study indicated that the comprehensive ARDMS certificate is the one most often required by employers. Twelve out of thirteen respondents stated that this certificate was a required condition of employment, even in the absence of any legal mandate. The certificate may be obtained by passing a two-part written exam. The first part covers ultrasound physics and instrumentation and is given to all applicants, and the second part is broken down into four specialty options: obstetrics/gynecology, abdomen, neurosonology, or opthamology. The applicant has the option of taking the test in any one of these specialty areas.

The two specialized certificates can also be obtained by passing written exams administered by the ARDMS. To become a Registered Diagnostic Cardiac Sonographer (RDCS), the applicant must pass a test in cardiovascular principles and instrumentation and adult or pediatric echocardiography. The Registered Vascular Technologist (RVT) credential can be obtained by passing an exam in vascular physical principles and instrumentation and vascular technology (ARDMS, 1991). Because these credentials are considered advanced, sonographers would normally need the RDCS or RVT only if they were planning to specialize in cardiac or vascular ultrasound

Magnetic Resonance Imaging Credentialing

Magnetic resonance imaging currently has neither a California license requirement nor a national credentialing body. The newest of the imaging occupations studied, MRI is still developing standards and norms of practice. The Society for Magnetic Resonance Imaging (SMRI) (1990), founded in 1983, is a national body that sponsors meetings and workshops for technologists and others working with MRI, but it has yet to introduce any type of credentialing process.

Changing Skill Requirements in Imaging Occupations

Introduction

Similar to many of the other occupations examined later in this report, changes occurring in medical imaging occupations and the health care environment more generally have had major impact on the skills required in these jobs. Due to pressure from federal health care funders to control costs, new applications and more complex technologies, advances in medical research, movement of practitioners outside the hospital setting, and persistent labor shortages, imaging professionals have been required to broaden their knowledge base and increase their skill levels. Both technical and nontechnical knowledge and skill requirements have been affected by these trends as they changed and expanded a wide variety of job duties.

For example, cost control efforts and demographic trends have increased the extent to which members of almost every imaging profession work independently and need to communicate more effectively with diverse groups of patients and other medical professionals. These expanded duties and responsibilities depend on many technical and nontechnical skills that were always important, but now are increasingly so. In addition, many of the changes occurring in these fields have also required imaging specialists to acquire knowledge in new areas, particularly knowledge of subspecialties or related imaging fields.

The same trends that have expanded knowledge and skill requirements in the past are likely to do so in the future. For example, many imaging technologies such as MRI, diagnostic radiography, nuclear medicine, and radiation therapy provide important tools for diagnosing and treating cancer or other conditions. Continued aging of the population will produce a growing incidence of cancer, and research advances that will respond to this growing need will create new areas of technical knowledge in imaging fields.

Future technology changes in many imaging occupations will also increase nontechnical skill requirements. Specifically, as new technologies are introduced technologists will work more closely with physicians to implement new approaches. As a result, they will be called upon to assess the effectiveness, benefits, and deficiencies of these new techniques. These responsibilities will require technologists to have strong interpersonal and communications skills and to have excellent teamwork abilities.

Survey Results on Skill Requirements

For the purpose of the surveys, skills, knowledge, and ability in medical imaging occupations were grouped into four categories: (1) Assessment and Diagnosis, (2) Treatment, (3) General Knowledge, and (4) Administrative and Communication Skills. For each skill, knowledge, and ability, survey respondents used a five-point scale to indicate how important that area was for entry-level job performance; how important it was for advancement; and how the skill had changed in importance over the past five years. The appendices to this report contain complete results of the surveys for the medical imaging occupations.

The four skill, knowledge, and ability (SKA) categories are defined as follows:

1. *Assessment and Diagnosis:* Skills, knowledge, and abilities that are directly related to understanding the meaning of patient symptoms and to evaluating test results. This category also includes the ability to interpret readings on various monitors and diagnostic equipment.

2. *Treatment:* Skills, knowledge and abilities that are necessary to provide the various types of patient treatments that are required for the job, including knowledge of why the treatments are necessary and how these treatments help patients.

3. *General Knowledge:* Skills, knowledge, and abilities that are indirectly related to the daily care of the patient, but necessary for the technologist to provide effective assessment, diagnosis, and treatment. These include, for example, knowledge of general anatomy, physiology, and disease pathology.

4. *Administrative and Communication:* Skills, knowledge, and abilities that are used by the technologist to interact with others (patients, coworkers, and supervisors) in the hospital, and those skills that are used in a managerial or supervisory capacity.

For analyses of skills, knowledge, and abilities that were important for entry-level job performance and for advancement, findings were grouped into four levels: (1) *very important*, (2) *moderately important*, (3) *somewhat important*, and (4) *not important*. With respect to changes over time, skills were grouped into *much more important*, *more important*, *somewhat more important*, and *not more important*. This classification of skills into four levels of importance was determined by the proportion of survey respondents who assigned a skill category to the highest importance level.

1. The highest levels, *very important* or *much more important*, represented eighty percent to one-hundred percent agreement among respondents that the skill was either important or had gained in importance.

2. The next tier, *moderately important* or *more important*, represented fifty percent to seventy-nine percent agreement.

3. The third category, *somewhat important* or *somewhat more important*, represented twenty percent to forty-nine percent agreement.

4. The bottom tier, *not important* or *not more important*, represented zero to nineteen percent agreement.

The following sections present the patterns of skills that emerged from these survey findings. The results discussed here were based on analyses of fixed-response, Likert-type questions on the survey forms. For example, responses to questions about the importance of individual skills ranged from critical to not important at all. However, the comments made by experts participating in the in-depth interviews, focus groups, and open-ended survey responses serve to enhance and further illustrate these findings.

EKG Technician

Overview

The *Allied Health Education Directory of 1990* (Gupta & Hedrick, 1990) defines the following as job responsibilities of the EKG technician:

- Apply electrodes to the patient's body.
- Explain the electrocardiogram procedure to the patient.
- Switch on the machine and record the electrical impulses.
- Prepare the electrocardiogram for analysis by a physician.
- Call attention to deviations from the normally recorded average.
- Care for equipment.
- Perform or assist in more specialized cardiac testing.
- Schedule appointments, maintain files, and type physician's interpretations.

EKG technicians perform their jobs under the direction of physicians who use electrocardiograms to help diagnose heart disease, monitor the effects of drug therapy, and analyze changes over time in patients' heart functioning. Because they can easily move their equipment, technicians can practice in a wide variety of settings, including hospital cardiology departments, physicians' offices, and at the patient's bedside.

As new technologies such as Holter monitoring and stress testing have become widespread, employers seeking to hire EKG technicians have placed greater emphasis on these newer technology-related skills. Yet in recent years, the most significant shift in skill requirements for technicians has been that more interpersonal and administrative skills are required. Increased demand for the latter skills was largely due to the growing amount of paperwork required to document reimbursement-eligible tests and treatments and the changing patient population, made up of individuals who tend to be older, have more serious illnesses, and are more demographically diverse.

Skills Important for Entry-Level Positions

Findings from the study indicated that important skills for entry-level positions involve all four skill categories that were included in the hospital surveys. However, experts participating in the research said that EKG technicians are not normally expected to master many of the more advanced procedural, technical, or administrative skills early in their careers. Entry-level technicians, nevertheless, are expected to exercise a certain level of independent judgment, have basic job-related knowledge, and comprehend the principles underlying cardiology. For example, survey responses indicated that *very important* skills include procedural ones, requiring the ability to run and monitor an EKG test; technical skills, indicating clear knowledge of the heart and its functioning; interpersonal and communication skills, dealing with patients and other health professionals in a courteous and effective manner; and administrative and organizational skills, having the ability to perform basic equipment maintenance.

Interestingly, the greatest number of *very important* skills chosen by survey respondents fell into the interpersonal and communication skills category. Furthermore, with the exception of supervising others and taking patient histories, respondents placed all interpersonal and communication skills listed in the survey at the highest level of importance. The survey respondents identified a broad range of communication and interpersonal skills as necessary, including the ability to explain procedures to patients and to relax them as well as to communicate with both nursing staff and physicians. Respondents also emphasized the ability to exercise independent judgment and to take action, although these abilities did not fall into the highest level of importance.

Skills Important for Advancement

In order to advance, EKG technicians must often leave the field and move into an occupation requiring greater skills and/or education. Technicians generally do not follow a well-defined career path because the possibilities for advancing within the field are limited to only those individuals who have completed the basic three- to four-month training course.

However, EKG technicians can build upon their entry-level skills and remain in the field by expanding the scope of their jobs to include additional technology applications such as Holter monitoring, stress testing, and echocardiography (Bay Area Council, 1990, p. 28). Holter monitoring and stress testing are variations on the standard EKG test, and echocardiography is a more advanced technique for examining the heart using ultrasound technology. Candidates can obtain a number of credentials from the Cardiovascular Credentialing International (CCI) including a Certificate of Completion for Holter monitoring, the Certified Cardiographic Technician (CCT) for those who can perform both Holter monitoring and stress testing, and the Registered Cardiovascular Technician (RCVT) for those who can perform Holter monitoring, stress testing, echocardiography, and Doppler (CCI, 1990).

Despite the opportunities that EKG technicians have to learn these advanced technologies, only two of ten survey respondents said they would continue to work in the same occupation. Other survey respondents said they wanted to be instructors, nurses, echocardiographers, ultrasound technicians, and physical therapists, indicating that the career path for the EKG technician leads in many different directions to other health care occupations.

Survey results indicated that all of the *very important* skills for advancement were also *very important* for entry-level work, along with two other skill areas: knowledge of advanced and specialized functions within the occupation, and more comprehensive administrative and supervisory skills. Not surprisingly, the technical skills and knowledge that respondents deemed important for advancement were in the areas of specialized testing and advanced technology. For example, they considered the ability to perform both Holter monitoring and stress testing to be important, along with the ability to use computer equipment. In addition, the ability to determine which sections of the test should be reviewed by a physician was an interpretive skill that they indicated was significant.

Survey respondents also stated that administrative and supervisory skills were important for advancement. These skills included the ability to supervise other staff, the ability to keep detailed records of patients, tests, and supplies, and the ability to prepare written reports. Overall, the survey findings suggest that in order to advance, EKG technicians must assume a larger role in meeting the organizational and administrative demands of their departments.

Skills That Have Gained in Importance

Survey respondents said that no skill areas became *much more important* during the past five years. This was probably due to the fairly limited nature of the EKG occupation and the lack of new technologies that have been introduced into the field. However, many skills became *more important*, and these shifts occurred most frequently in the areas of interpersonal and administrative skills, knowledge of the EKG procedure, and knowledge of the basics of cardiology.

Respondents indicated that all of the interpersonal skills have become *more important*, and among these skills virtually all of them, with the exception of taking patient histories, have also become *very important* for practice at the entry-level. To emphasize the importance of interpersonal skills, one technician said, "You learn what to look for, and you can assess a patient in a minute when you first walk into a room. You can tell how to approach the patient and how he or she will react."

A smaller number of technical skills also emerged as having gained in importance. Among these skills were monitoring EKG results, the ability to perform CPR, the ability to type, knowledge of heart disease, medical terminology, and basic equipment maintenance, and the ability to interpret physicians' orders. According to survey respondents, the ability to perform Holter monitoring, stress testing, and echocardiography only gained somewhat in importance. This is contrary to the opinion of many employers who expressed strong interest in hiring technicians with skills and knowledge that go beyond basic EKG testing.

Nuclear Medicine Technologists

Overview

The *Allied Health Education Directory of 1990* (Gupta & Hedrick, 1990) defines the following as job responsibilities of the nuclear medicine technologist:

- Take patient history and relate it to pending procedures.
- Instruct patient before and during procedures.
- Prepare and, under a physician's direction, administer radiopharmaceuticals, and monitor quantity and distribution of radionuclides in patient.
- Perform *in vitro* and *in vivo* diagnostic tests.
- Procure supplies and equipment and schedule patient exams.

Nuclear medicine technologists are responsible for using radionuclides, unstable atoms that emit radiation, to perform procedures that are designed to diagnose or treat disease. (Technicians actually administer radiopharmaceuticals only under direct supervision of a physician.) These procedures typically involve preparing radioactive substances or isotopes, administering them to patients, operating equipment that takes images of radioactive substances within the body, and reading the results. Technologists also frequently perform laboratory tests using radioactive materials, and they are required to know and conform to complex safety and regulatory requirements regarding the handling of radioactive material.

As a result of new computerized technologies, the emergence of more than ninety different diagnostic tests, and the increased documentation required by federal and state agencies to monitor the handling of radioactive material and provide reimbursement for medical tests and treatment, the responsibilities of nuclear medicine technologists have become increasingly complex in recent years. Moreover, in many hospitals most physicians prescribing the use of nuclear medicine work part-time and have only limited direct patient contact. Consequently, nuclear medicine technologists work independently once they have received physicians' requests, and in almost all instances are responsible for communicating with patients about procedures and safety precautions.

These recent developments have led to important changes in the skills required of nuclear medicine technologists. In particular, they must demonstrate a high level of independent judgment and a substantial knowledge of anatomy, physiology, pathology, and advanced mathematics, including calculus. Because of their important role in providing patient education, it is critical that nuclear medicine technologists have excellent communication skills.

Skills Important for Entry-Level Positions

Nuclear medicine technologists indicated that they needed a broad range of skills in all four survey categories to perform at the entry level. These skills included not only knowledge of image taking and patient positioning, but also a significant amount of interpretive and scientific understanding of images, radiation, and advanced computer and other technologies. Additionally, they noted the ability to work with staff, patients, and equipment as *very important.*

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Respondents said almost all of the various procedural and technical skills included in the survey were *very important,* indicating that incoming technologists are expected to have the scientific background necessary to comprehend safe handling of radiation and perform imaging, radiation, and lab procedures that constitute much of their work. The ability to evaluate images for technical quality and interpret a medical history for imaging implications are both entry-level abilities that demand critical thinking skills.

Beyond these necessary skills, technologists must have general anatomical and physiological knowledge as well as specific knowledge of body tissues, principals of radiation, and computers. Examples include knowledge of cross-sectional anatomy, radiation physics, isotopic energies, and radioactive decay, as well as knowledge of the software used to input information into a computer and to analyze test data.

Because a large part of a nuclear medicine technologist's day is spent dealing with patients and physicians, respondents deemed interpersonal skills as critical to their job performance. With the exception of the ability to supervise, they identified all interpersonal skills included in the survey as *very important.*

Respondents chose only those administrative skills that were directly related to patient care at the highest level of importance for entry level. Skills such as the ability to interpret physician's orders and knowledge of procedures for monitoring and testing radiation were considered to be *very important.* However, other skills or knowledge, such as preparing written reports or knowledge of general department procedures (e.g., keeping detailed inventory records of radioactive materials), were viewed as important only for advancement.

Skills Important for Advancement

Advancement for nuclear medicine technologists, as for radiologic technologists, sonographers, and MRI technologists, often means becoming certified in a second or third specialty and then applying more diverse and higher-level skills to their positions. The medical imaging fields are connected through overlapping skill requirements, and in many cases employers prefer to have technologists who are competent and certified in more than one specialty. For example, it would not be unusual to find a nuclear medicine technologist who had started out as a diagnostic radiologic technologist. In fact, technologists often advance by completing additional formal or informal training to become certified in new imaging specialties. Today technologists frequently train in both MRI or ultrasound, innovative imaging fields that offer new challenges and opportunities for financial benefits.

In addition, nuclear medicine technologists often move into supervisory and administrative areas, or they specialize in their fields by working as researchers or instructors. Survey results confirm that there is no single career path that all nuclear medicine technologists follow. When questioned about advancement goals, three out of ten technologists responded that they would like to move into administration, two said that they wanted to remain in the same position, three wanted to retire or leave the field, and one wanted to teach nuclear medicine.

Although technologists must first have a significant knowledge base to enter the profession, nuclear medicine technologists said that in order to advance, they must acquire a more comprehensive understanding of the technology of nuclear medicine, which includes building upon their knowledge of science, math, and computers, and increasing their ability to function effectively in technical, administrative, and supervisory roles.

Furthermore, respondents said that to achieve upward mobility in their professions, they needed the ability to work at a more abstract level by applying appropriate academic knowledge to concrete imaging tasks. They mentioned using computers and applying basic scientific and mathematical concepts as important technical skills or knowledge required for advancement. In fact, two computer-related skills, the ability to input data and knowledge of computers, were among the six skills they noted as *more important* for advancement than for entry level. Respondents also considered the ability to apply conceptual knowledge of electronics and to use clinical lab techniques as important.

Beyond applying technical skills and knowledge, nuclear medicine technologists must also assume a substantial administrative role to advance in their field. Although these responsibilities are not central to their jobs, respondents said that many administrative abilities, including the ability to write reports and purchase equipment, were integral for advancement. This finding reflects the expanded role state regulation plays in nuclear medicine by requiring technologists to account for all radiation usage. Supervisory skills, which were selected by respondents in all six medical imaging occupations, were also considered important for advancement.

Skills That Have Gained in Importance

In contrast to the finding that technical and administrative skills are most necessary for advancement, procedural skills gained the greatest importance for nuclear medicine technologists over the past five years. With the exception of one technical area, the ability to input data into a computer, the skills respondents identified as *much more important* were most frequently related to direct, hands-on job tasks. The critical nature of these job-related abilities reflected both the increasingly independent structure of the technologist's practice, and the growing responsibility for regulated monitoring of radioactive materials.

Specific skills that respondents chose as becoming *much more important* were the technologist's ability to understand and work with imaging equipment, radiation, proper handling and disposal of radioactive substances, and computers. Here, the technologist must have not only concrete knowledge of computers, but also a firm grasp of the abstract knowledge needed to operate advanced equipment and perform the job effectively. The ability to use independent judgment on the job and work autonomously with equipment were other areas that respondents considered to be *much more important* than they had been previously. These requirements also reflect the increasingly independent nature of the nuclear medicine technologist occupation.

Respondents indicated that skills requiring cognitive ability are becoming *more important*, while less interpretive skills, in general, are becoming only *somewhat more important*. For example, in the area of interpersonal skills, the ability to relieve patient anxiety was considered to be *more important*, while the ability to explain procedures to patients was regarded as only *somewhat more important*. The difference in the abilities that underlie these two tasks illustrates the more general distinction between the skills areas that emerged as *more important*, and those that were only *somewhat more important* for nuclear medicine technologists. The *more important* skills are more frequently based on abstract knowledge than are skills identified as *somewhat more important*. For example, while most technologists are capable of explaining a pre-planned procedure, fewer are capable of relieving patient anxiety. Because relieving anxiety is a skill that must be applied differently to each patient, it is more difficult to learn.

Diagnostic Radiologic Technologists

Overview

The *Allied Health Education Directory of 1990* (Gupta & Hedrick, 1990) defines the following as job responsibilities of the diagnostic radiologic technologist:

- Provide patient imaging services under the direction of a physician.
- Exercise independent judgment by adopting variable technical parameters of the imaging procedure.
- Explain the imaging procedure to the patient.
- Process film and evaluate radiologic equipment.
- Limit radiation exposure to patient and self.
- Maintain written records of patient treatments.

Diagnostic radiologic technologists, or "rad techs," are primarily responsible for imaging all parts of the human body. The most important tasks they perform include interpreting the imaging request from the physician, explaining the imaging procedure to the patient, setting up and "shooting" the image, and preparing a copy of the film, or computer generated image, for the physician to review. The standard protocol for this profession has not changed as much as that for the newer imaging occupations. However, survey results show that the rad tech is responsible for a much greater body of knowledge and must act more independently than ever before.

In recent years as imaging technology has advanced, the skills required of rad techs have become more complex. The impetus for change in this field, as in all imaging fields, is a combination of technological advances, scarcity of qualified technologists, intensified pressure on health care providers to control costs, and an increasingly regulated and litigious work environment. The results of these pressures are manifested in the skills, knowledge, and abilities that respondents deem as important to enter and advance in the field, as well as those skills that have increased the most in importance over the past five years.

Reflecting the primary changes that have occurred in the health care industry, job skills required of rad techs have been expanding for several years. The greatest overall increase in required job skills has occurred in technical and procedural areas, which are most closely tied to new technologies. In addition, rad techs have become more aware of the legal and financial implications surrounding their decisions and actions.

Skills Important for Entry-Level Positions

Respondents indicated that the skills, knowledge, and abilities necessary to function effectively at the entry level were distributed across all four skill categories. According to the survey results, entry-level rad techs must have a high degree of technical and interpersonal skills, including the ability to perform basic imaging procedures and administrative tasks. Beginning technologists are expected to have mastered basic and advanced imaging techniques and must acquire a solid understanding of the scientific principles underlying radiography. The ability to properly position a patient, to take a good image, and to detect abnormalities or artifacts within the images produced were all selected as *very important*. In addition, respondents confirmed that entry-level technologists must be able to work with patients and colleagues in a professional manner, and be competent in related areas such as medical emergencies, ethics, and radiation protection laws.

Survey respondents identified most procedural and technical skills as *very important,* suggesting that entry-level technologists must have the ability to set up, perform, and evaluate imaging procedures. The skills involved in setting up an image require a knowledge of how to properly position the patient and x-ray equipment and how to shield the patient's organs from unnecessary radiation. With the proper amount of education and practice, these skills can usually be mastered.

On the other hand, skills requiring the technologist to interpret and evaluate images require further judgment and imagination, suggesting that even at the entry level the technologist is expected to act autonomously and with discretion. Respondents selected all three procedural skills—ability to evaluate images for technical quality, recognize abnormalities within images, recognize the need for additional images, as *very important*.

Moreover, respondents selected many technical skills as *very important*, ranging from knowledge of physics, anatomy, and medical ethics terminology to knowledge of standard and emergency patient care. They chose not only skills directly associated with the imaging process, but also those demonstrating a thorough understanding of the laws and ethics governing the imaging profession. For example, they selected knowledge of both medical ethics and radiation protection standards as *very important*. In addition, respondents said that technologists' patient care skills should be sophisticated enough to enable them to respond to unusual situations, and they considered the ability to respond to medical emergencies and to recognize adverse medical reactions as indispensable.

Likewise, survey responses revealed that entry-level rad techs spend a considerable amount of time with patients, but less time than supervisors or chief technologists who perform administrative tasks. Respondents chose all interpersonal skills, except supervision skills, as *very important* because their job requires them to spend the bulk of their day working with patients and communicating effectively with physicians.

Not surprisingly, relatively few administrative skills were viewed by respondents as important for entry-level job performance. They indicated that administrative skills involving departmental management, report writing, and advanced equipment maintenance were more germane at the advanced technologist level.

Skills Important for Advancement

Advancement for rad techs usually involves developing specialized skills or moving into a supervisory position. Because the imaging professions included in this study have overlapping skill requirements, it is not surprising that many technologists view advancement in terms of mastering advanced technical skills or techniques in a related field. Since cost control has become and will continue to be a major concern of health care managers, technologists who can perform more than one job will be in greater demand.

The second major route for advancement within the profession is by moving into supervisory or instructional positions. Many technologists attempt to advance into chief technologist positions within hospitals, or they become instructors for technologist training programs. Rad techs said there are many possible career routes to pursue, and they did not want to remain in their present positions for the rest of their professional lives. When questioned about their future plans, technologists mentioned a number of ambitions. For example, out of eighteen survey responses, the four given most frequently were MRI technologist (5), chief technologist/supervisor (4), instructor (3), and CT technologist (2). Only one respondent wanted to remain in the same position.

Respondents verified that both the ability to function in a more technologically complex environment and proficiency in administrative and supervisory skills were crucial for advancement. In order to advance, technologists indicated that they should enhance their technical skills in computers and pharmaceuticals and develop more advanced anatomical knowledge. In addition, they should be able to supervise other technologists and assume administrative functions in the radiologic technology department.

Survey respondents said that advancement-related skills, requiring technologists to apply abstract anatomical and pharmaceutical knowledge to particular imaging situations, are built upon the more basic ones required for entry level. Specifically, they chose knowledge of cross-sectional anatomy, pathology, radiobiology, and radiopharmacology as *more important* for advancement than for entry-level positions. All these skills reflect the need for the technologist to have more comprehensive knowledge and the ability to use it appropriately. Interestingly, respondents regarded only one computer skill as *very important* for advancement, the ability to use a computer keyboard, while the more advanced programming and software skills were viewed as *moderately important.*

In addition, survey respondents indicated that administrative and supervisory skills were as important as technical skills for advancement in radiologic technology. Rad techs chose virtually all administrative and interpersonal skills as *very important* for advancement. Because most technologists work in hospitals or other large health care settings, they clearly need to function as supervisors and administrators if they wish to advance. Further, the continuing increase in private-sector litigation and public-sector regulation requires the advanced technologist to be competent in all facets of record keeping and report writing. Skills that they mentioned as more important for advancement than for entry-level included the ability to prepare written reports, skill in keeping detailed patient records, and the ability to perform purchasing tasks.

Skills That Have Gained in Importance

Because the occupation of diagnostic radiologic technologist has existed for a number of years, some might expect that the skills needed to perform this job effectively might have changed more slowly than those required of newer imaging professions. Our survey results affirmed this assumption. In fact, only two skills, computer keyboard skills and knowledge of medical ethics, became *much more important* over the past five years.

Survey respondents noted that procedural and technical skills were *more important*, reflecting the increased complexity of the work of the rad tech. For example, one rad tech with many years of experience said that a combination of factors, such as more patients with serious illnesses, better imaging equipment, and higher expectations, have led to increased difficulty in making the average diagnosis than in the past. As a result, to perform their job effectively, rad techs must learn a complex mix of technical skills such as recognizing images for technical quality, applying computer programming skills, and using knowledge of cross-sectional anatomy. However, it is important to note that for rad techs, the largest number of skills were found not in the *more important* category, but in the *somewhat more important* category, confirming the fact that the profession has changed more slowly than newer imaging occupations such as ultrasound and MRI.

Finally, respondents indicated that only those interpersonal and administrative skills relating directly to patient care have become *more important*. Other interpersonal and administrative skills have been overshadowed by the importance rad techs have placed on the technical requirements of their profession.

Radiation Therapy Technologists

Overview

The *Allied Health Educational Directory of 1990* (Gupta & Hedrick, 1990) defines the following as job responsibilities of the radiation therapy technologist:

- Work with the therapy team to develop a plan of treatment for each patient.
- Administer radiation therapy services to patients under the supervision of a radiation oncologist.
- Monitor the patient's condition during the course of the treatment.
- Maintain detailed treatment records.
- Limit patient's radiation exposure to the minimum necessary.
- Explain therapy procedures to patients and offer reassurance when needed.

By administering doses of ionizing radiation to prescribed body parts, radiation therapy technologists assume a major role in treating cancer patients. Using a plan of treatment designed by a dosimetrist, the therapist sees the same patient for a series of treatments, often on a weekly basis. The therapist must exercise extreme caution when treating patients, since a poorly aimed radiation beam or exposure of other body parts can cause serious harm to the patient. Because radiation therapy often results in side effects such as hair loss and vomiting, the therapist must not only observe the patient for severe reactions but also must relate well to the patient and express empathy and understanding.

The changes occurring in radiation therapy are in some respects less dramatic than those taking place in the diagnostic imaging professions because radiation therapy, by its very nature, continues to rely on radiation as the vehicle for treating cancers within the body. Nevertheless, the skills and abilities required of the radiation therapist have increased in the areas of technical and procedural knowledge. Specifically, therapists are required to understand and operate the newest equipment, have the ability to interpret diagnostic images accurately by using advanced equipment, and function in an increasingly complex regulatory environment.

Skills Important for Entry-Level Positions

Radiation therapy technologists must display a wide range of technical, cognitive, and interpersonal skills at the onset of their careers. For instance, they must understand the mathematical, scientific, and anatomical principles underlying therapeutic practice, and somewhat unlike our findings for rad techs, they must also have certain administrative skills. Radiation therapy is a small profession, accounting for only 2.7% of the total number of radiologic technologists in California. Findings from this survey suggest that because of their small numbers, therapists are more responsible for overall department management responsibilities at an earlier stage in their careers.

Survey respondents found the majority of procedural skills to be *very important,* such as performing standard therapeutic treatments, interpreting images taken by diagnostic technologists, and understanding the implications of those results for therapy. Some representative procedural skills for therapeutic functions include positioning equipment and setting controls, administering radiation therapy treatments accurately, and preparing patients for exams. Radiation therapy technologists also must demonstrate the ability to evaluate images for technical quality and to interpret previous diagnostic test results.

Respondents regarded a number of technical skills as *very important* for entry-level including strong background knowledge of radiation, anatomy and physiology, mathematics, and the ability to apply geometry, medical ethics, and legal principles.

Because of the kinds of patients who receive radiation treatments, interpersonal skills are perhaps more important for the radiation therapist than for any other imaging professional. Therapy patients tend to be very sick, sometimes terminally ill, and it was clear from study participants' comments that therapists must develop good rapport with their patients and exercise a very high level of understanding and consideration. Most interpersonal skills included in the survey proved to be very important for entry-level therapists, and skills such as expressing empathy or relieving patient anxiety were placed at the highest level of importance.

In contrast to diagnostic technologists, radiation therapists selected most administrative skills as *very important* for entering therapists. The small number of radiation therapists, an estimated five hundred to five hundred and fifty in California, helps to explain how therapists and other imaging professionals differ. Because of their small numbers, many radiation therapists are expected to take on a wide range of tasks when entering practice. As a result, they not only perform radiation treatments, but also keep records, interpret physician's orders, and use patient charts to identify preliminary information. One therapist who participated in this study aptly described the difference between diagnostic and therapy technologists. She said that when she was in diagnostic, she felt as if she were working *for* the physician, while in therapy she felt as if she were working *with* the physician.

Skills Important for Advancement

Therapy technologists follow advancement routes similar to those of many other imaging professionals. Such advancement paths may include cross training into another imaging specialty, moving into a supervisory or administrative position, or becoming an instructor or researcher. Although radiation therapy technologists perform a job that is markedly different from that of diagnostic radiologic technologists, much of the scientific and anatomical knowledge necessary to perform the two jobs is similar. Even though it is more common for diagnostic technologists to cross train into radiation therapy, sometimes radiation therapists train into diagnostic. This usually occurs because the same cost control measures affecting other imaging professions also affect radiation therapy, which means that many hospital administrators would prefer to hire imaging professionals who are capable of performing two or more jobs. In addition, because the knowledge bases of radiation therapists and diagnostic technicians overlap, they complement each other in this combined career area.

The second major avenue for advancement, moving into an administrative position, is more frequently followed by radiation therapy technicians than by rad techs. When asked about the likelihood of a rad tech without therapy experience becoming an administrator, one administrator commented, "Unless you were in a huge department where you were an administrative technologist, I don't see how you could ever become the boss or the chief technologist without first being a [radiation therapy] technologist."

Most radiation therapy technologists treat very sick patients, and they frequently view their work as similar to that of teachers or social workers. Therapists indicated often in the survey that they entered a medical field because they wanted to help others and said that promotions to administrative positions were not especially appealing. In addition, when asked about future ambitions, not a single radiation therapist expressed a desire to move into a supervisory position. Out of six therapists who responded to this question, two said that they wanted to remain in the same position, two responded that they wanted to leave the medical field, and two said that they didn't know what they wanted to do next.

Radiation therapy technologists who participated in this study also revealed that proficiency in advanced procedural and technical skills, including specific treatment, computer, and anatomical skills, were the primary requirements for those who wanted to advance in the field. Beyond these advanced procedural and technical skills, respondents said that the ability to work independently using this advanced knowledge was also important.

In addition, survey respondents indicated that the ability to perform more complex and varied treatments were procedural skills that were indispensable for advancement in the field. They selected five specific treatment skills as *more important* for advancement than for entry-level work. From the ability to cut blocks used to direct radiation, to skill in taking blood counts, these abilities require that technologists acquire specific, advanced-treatment skills in order to perform in their job. Interestingly, respondents said the ability to read MRI and CT scans was *very important*, which demonstrates that although the therapy technologist may not be required to perform either of these special procedures, a substantial understanding of how they work is necessary.

Moreover, respondents said the ability to understand computer modeling and simulation and to write computer programs, as well as knowledge of cross-sectional anatomy, were skills *more important* for advancement than for entry-level work. Therapists use these technical skills when applying more complex treatments and in helping to plan and design them.

In contrast to the large number of skills necessary for advancement in the procedural and technical areas, respondents chose only three skills in the administrative and interpersonal skill categories as *more important* for advancement than for entry-level work. These skills included the ability to refer patients to other services, skill in suggesting modifications to treatment plans, and the ability to prepare written reports.

Skills That Have Gained in Importance

Radiation therapy, like diagnostic radiology, is an occupation that has been in existence for a long time. Not surprisingly, survey respondents said that change in their profession has not been as noticeable as that occurring in newer, more dynamic imaging professions over the past five years. In fact, they said there weren't any skills that have become *much more important*. However, they did indicate that certain skills have recently become *more important,* such as the ability to work effectively with a higher level of advanced technology and to interact on a professional level with physicians, while at the same time using independent judgment.

The increased technical knowledge and greater cognitive skills that technologists need today are underscored by respondents' selection of skills that have gained in importance and that are very important for entry-level positions. In the sphere of technical knowledge, respondents said they should have knowledge of new technologies and understand the many academic aspects of radiation therapy, including oncology, physics, and biology. At the same time, they said they should have better reading skills and an improved ability to evaluate various types of images and test results. Examples of such skills included the ability to interpret previous diagnostic test results, to evaluate images for technical quality, and to read MRI and CT scans.

In contrast to the changing cognitive and technological areas, survey respondents chose relatively few interpersonal or administrative skills as those that have increased greatly in importance. Since therapists have used interpersonal skills for a long time, it is not surprising that respondents selected the ability to communicate with the physician and to explain a procedure to a patient as skills that have become *most important*. In addition, the ability to identify necessary preliminary information from a patient's chart was one administrative skill that they indicated has become more important.

Diagnostic Ultrasound Technologists

The *Allied Health Education Directory of 1990* (Gupta & Hedrick, 1990) defines the following as job responsibilities of the diagnostic ultrasound practitioner:

- Review patient history and supporting data in order to plan tests or procedures and obtain best results.
- Explain ultrasound procedure to patient.
- Prepare patients for exams through proper positioning and application of gels.
- Use ultrasound under the supervision of a physician to gather data.
- Prepare sonographic data for review by the physician.
- Maintain records of patient tests or procedures.

Diagnostic ultrasound technologists, or sonographers, are primarily responsible for performing the appropriate sonographic procedures, processing sonographic data and other pertinent observations made during the procedure, and recording anatomical pathological and/or physiological data for interpretation by the physician. The diagnostic ultrasound technologist must exercise discretion and careful judgment when performing sonographic services in order to obtain, review, and integrate patient history and supporting clinical data to arrive at the optimum diagnostic results. In addition, the sonographer provides patient education related to medical ultrasound and promotes the principles of good health (Gupta & Hedrick, 1990).

Skills Important for Entry-Level Positions

When beginning their careers, ultrasound technologists are expected to have a comprehensive set of skills, knowledge, and abilities related to procedures, technical issues, and interpersonal capabilities. Ultrasound is a relatively new technology, and many sonographers developed their skills through hospital training while working in other imaging fields. In general, technologists are trained to perform and evaluate scans in three major areas: obstetrics/gynecology, general abdominal, and cardiovascular. There are different certifications and series of tests technologists must pass to be registered in all four areas. Equally important for the sonographer is the ability to communicate effectively with patients, physicians, and coworkers.

Respondents identified most of the procedural skills included in the hospital survey as being *very important* for entry-level positions, confirming the belief that they must have the ability to perform a full array of ultrasound procedures when beginning practice. For example, sonographers must be able to properly place gels and transducers on the patient, conduct abdominal sonography, operate video equipment, recognize the need for additional images, as well as have knowledge of correlating technologies such as MRI, CT, or angiography. The importance of learning the proper skills was further underscored by one survey respondent who said that sonography is very "operator dependent," meaning that the technologist can miss a tumor altogether or make one where none existed if the person's skill level is not up to par.

The new sonographer must also have several technical skills that demonstrate a high level of computer, scientific, and anatomical knowledge. Survey respondents said *very important* computer skills ranged from data entry and knowledge of software programs to the ability to comprehend computer simulation. Moreover, sonographers needed a wide range of scientific knowledge, from that of Doppler techniques to the ability to perform duplex imaging. Sonographers must also be knowledgeable about the various types of anatomy—abdominal, cardiac, vascular, and cross-sectional—as well as have an understanding of obstetrics and gynecology.

Respondents also selected most interpersonal skills included in the survey at the highest level of importance. With the exception of the ability to supervise others, they indicated that all interpersonal skills were *very important*. These skills were both communicative, such as the ability to explain a procedure to a patient, and interpretive, such as the ability to work independently and use judgment. Because sonographers work directly with patients when performing scans, it is not surprising that respondents would place so much value on interpersonal skills.

In contrast to other skill groupings, respondents found that most administrative skills were only *moderately important* at the entry level. Although sonographers are expected to have a great deal of job-related knowledge at the start of their careers, administrative duties are not among these required skills.

Skills Important for Advancement

The skills required for advancement in sonography cover almost every skill, knowledge, and ability in all four categories. For example, survey respondents selected several skills from the procedural, technical, and administrative groupings as being *more important* for advancement than for entry level. More specifically, in order to advance, sonographers must be able to scan many different body parts, apply background technical knowledge, and assume a larger administrative and supervisory role.

The most significant difference between entry-level and advanced sonographers was that the latter had the ability to perform many different kinds of scans. Three out of the four procedural skills that respondents reported as more important for advancement than for entry level involved different kinds of sonography such as vascular, peripheral vascular, and superficial parts. Because entering sonographers are already expected to have a great deal of procedural knowledge, skills important for advancement include the ability to apply established knowledge such as basic math and operating room procedures to new sonography techniques. In addition, survey respondents said the ability to perform echocardiograms and take blood/segmental pressures were two new skills especially important for advancement.

Like other imaging professionals, sonographers are expected to acquire advanced supervisory and administrative skills only after gaining experience. The ability to supervise others, keep track of patients' records and equipment, and present written reports on imaging work were duties that were considered important after they had worked in their profession for some time. Even though the percentage of sonographers working in hospitals is lower than that of other imaging professionals,[11] it is clear that developing better administrative and supervisory skills is considered important in all work settings, not only in large hospitals.

Skills That Have Gained in Importance

The past ten years have witnessed substantial change within ultrasound technology, thereby greatly altering the sonographer's responsibilities. The knowledge areas that have undergone the most change have been those in which technology has had the greatest impact. Whereas three procedural and fifteen technical skills have become *much more important* over the past five years, administrative or interpersonal skills were reported to have changed less. At the same time, respondents selected the majority of skills in all remaining categories as *more important*, indicating some degree of change in virtually all facets of their work.

Interestingly, the procedural skills that respondents selected as having become *much more important* over the past five years were also selected as being more important for advancement than for entry-level work. These three skills, vascular, peripheral vascular, and superficial parts sonography, are primarily the result of technological advances that have enabled the sonographer to see and interpret internal structures that could not be seen before. In fact, one ultrasound program director said that until a few years ago vascular work was not performed by sonographers, but has more recently become a specialty within the field.

Given the central role of technology in the sonographer's job, it is not surprising that several technical skills were chosen as having become *much more important*. In addition, respondents considered new imaging methods important in this changing occupation, along with increased computer and background knowledge. For example, survey results confirmed that both Doppler and duplex imaging have become critical skills for sonographers to understand and perform, as well as knowledge of computer simulation, which has increased significantly in importance.

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[11] One Massachusetts study reported than only fifty-eight percent of active sonographers practiced primarily in hospitals (AHRA, 1989, p. 4).

Furthermore, as improved technology has expanded the sonographer's capabilities, it has been necessary for them to upgrade their knowledge of anatomy and pathology in order to read higher quality scans. One senior administrator with many years of imaging experience indicated that cross-sectional anatomy had become indispensable for sonographers to learn because "it's not enough knowing where the vessels are, where the arteries are, and how they can shift and move. It's knowing cross sectionally how to deal with that because ultrasound uses a very thin slice as it moves up and down the body, and a person must be able to see that slice standing on end and recognize it." Therefore, respondents indicated that knowledge of obstetrics/gynecology and vascular and abdominal sonography, as well as improved knowledge of disease progression, have all become *much more important.*

Magnetic Resonance Imaging Technologist

Overview

According to information gathered from interviews, focus group discussions, and skills surveys, Magnetic Resonance Imaging (MRI) technologists can have the following job responsibilities:

- Receive information from the physician regarding patient's recommended procedure plan.
- Interview patients to get a medical history and make sure that the patient does not have a medical condition that would preclude using magnetic resonance.
- Explain imaging procedure to the patient and sedate patient before imaging procedure, if necessary.
- Connect imaging coils and prepare contrast agent, if needed.
- Perform the scans and review the images looking for artifacts.
- Make appropriate recommendations to the physician.

The MRI technologist works with state-of-the-art equipment capable of imaging injuries previously not readily visualized by computer tomography (CT) scanning, and is particularly useful in diagnosing brain and spinal diseases (Bagby & Hurley, 1986). MRI technologists frequently work with very sick patients who may need to be medicated or handled in special ways in order for the technologist to perform the scan. Because MRI equipment does not use radiation, the technologist has the flexibility to rescan or change parameters of the scan when necessary.

Skills Important for Entry-Level Positions

MRI is one of the newest technologies of the medical imaging occupations included in this study, and it was noted that few job duties of MRI technologists were practiced by other imaging professionals. The fact that this field has only been in existence for a short time may explain why nearly all of the skills, knowledge, and abilities in all four categories were placed at the highest level of importance, including skills in performing and evaluating magnetic resonance, understanding and applying the abstract principles behind MRI, communicating with others effectively, and performing administrative tasks.

MRI is often performed in imaging centers that are located apart from hospitals. Thus, MRI technologists must be capable of responding to a wide variety of medical emergencies with only limited access to other health professionals and must have well-developed patient care skills. In fact, several participants in this study emphasized the importance of these skills, saying that they strongly prefer to hire entry-level employees with previous patient care experience.

Furthermore, survey respondents selected nearly all of the procedural skills at the highest level of importance, indicating that entry-level technologists should be capable of preparing, performing, and evaluating MRI procedures. Specific examples include the ability to prepare a patient for an exam, skill in taking and developing the image, and the ability to recognize the need for additional images. Because many MRI technologists work in free-standing imaging centers, they do not have immediate access to a physician. One technologist said that "more than ever, we are finding that MRI technologists are having to do the job of radiologists [when working in independent practice settings] and are doing the preliminary work ordinarily done by physicians." The technologist estimated that sixty to seventy percent of MRI technologists now find themselves in this type of work situation.

In light of the many procedural skills that the MRI technologist needs, the independent nature of their work, and the way in which MRI images are produced, it is not surprising that survey respondents chose technical knowledge as *very important* for entry-level work, with a focus on knowledge of mathematics, science, computers, medical terminology, and pathology. Thus, they confirmed the fact that entering technologists are expected to have a broad knowledge base and that many employers prefer them to have had previous experience in other imaging fields.

Similar to other imaging fields, MRI demands that technologists communicate effectively and empathetically with patients, physicians, and other medical professionals. Because having an MRI is an uncomfortable, anxiety-producing procedure—patients are placed in a long metal tube—the technologist must be able to reassure patients who are nervous or claustrophobic. One radiologic technologist who has observed MRI technologists said that they must have better patient skills than other imaging technologists because of the claustrophobia some patients experience when they are placed in the imaging vessel. The rad tech guessed that about five percent of the population cannot undergo magnetic resonance because of claustrophobia. Survey respondents said that the ability to assess the patient's condition during the imaging procedure and to work with the patient's family members were also important interpersonal skills that the MRI technologist needed.

In contrast to some of the other imaging professions, from the beginning of their careers, MRI technologists are often expected to function in an administrative capacity. For example, respondents selected all of the administrative skills as being *very important,* among them the ability to maintain equipment, to ask appropriate questions in order to obtain more complete information for an incomplete imaging order, and to prepare written reports. Interestingly, among all of the imaging fields studied, it was only in this one that technologists selected report writing as being essential for entry-level work.

Skills Important for Advancement

MRI technologists occupy a position near the top of the imaging hierarchy, usually starting their careers in other imaging fields and then cross training into MRI. Because there is no other imaging field into which MRI technologists can cross train, advancement for MRI technologists consists almost exclusively of moving into administrative positions or becoming instructors. In answering the question on future goals, five out of seven survey respondents said they wanted to become a chief technologist, one wanted to remain in the same job, and one wanted to leave the medical field.

In order to advance, MRI technologists need computer and imaging skills, anatomical knowledge, and advanced supervisory skills. In general, respondents did not identify many skills as being *more important* for advancement than for entry-level work because they said the vast majority of skills on the survey were integral to entry-level functions. The only exception was in the technical skills category where respondents selected a significant number of skills as more important for advancement than for entry-level.

Within the procedural skills surveyed, respondents said only one skill, the ability to interpret a basic brain scan, was *very important* for advancement, but not for entry-level work. Because brain scans are more complex than most other types of magnetic resonance, more experience is needed to develop this skill.

As in other imaging occupations, the importance of new technology was reflected by respondents' choices of technical skills that were more important for advancement than for entry-level work. Both computer skills and knowledge of anatomy and pathology were designated as being important for advancement. In fact, respondents placed knowledge of software programs and the ability to change formulas within computer procedures at the highest level of importance. Further, since MRI can now show more detailed, complex images, technologists must know more about the human body in order to correctly interpret the significance of images produced. Within this set of skills, respondents chose knowledge of pathology and of functional systems (digestive, cardiovascular).

In contrast to previous skills groupings, interpersonal and administrative skills were not generally seen by respondents as markedly more important for advancement than for entry-level work. Since most entry-level MRI technologists have professional imaging experience, it is logical that they would have already mastered most of these skills in previous imaging work. Because these skills are transferable between occupations, it is likely that a diagnostic radiologic technologist who can work well with patients or keep detailed records could transfer those skills to the MRI technologist position. The only skill chosen by respondents as important for advancement but not for entry-level was the ability to supervise others.

Skills That Have Gained in Significance

MRI technologists in this survey found no skills to be *much more important* over the past five years. Although designers have made great strides in improving MRI technology, most technologists have not been working with MRI for many years. In fact, seven out of ten respondents said they have worked primarily with MRI technology for less than five years; consequently, there has been insufficient time for substantial change to occur in the workplace.

However, some limited change has occurred in the skills MRI technologists need. Survey respondents indicated that skills directly related to the imaging procedure and to interpersonal contact gained the most in importance. Respondents divided the skills roughly in half between those deemed to have become *more important* and those only *somewhat more important*. In general, procedural and interpersonal skills showed a larger gain in importance than those in the technical or administrative groupings.

Respondents said most of the procedural skills have become more important, possibly reflecting the fact that within the past few years, the daily job functions of the MRI technologist have become more autonomous. In addition, as the capabilities of MRI have become better understood and as the quality of the scans has improved, technologists have become responsible for preparing and performing an increasing variety of scans, and for working closely with physicians to identify how MRI techniques can be used. For example, one technologist said that many new MRI capabilities arose from technologist-physician interactions, and that these discoveries would not have been made without good communication between the two parties.

At the same time, respondents indicated technical skills that were used most frequently or involved the newest technology such as skills involving computers, advanced anatomy, and MRI technology and physics as having gained the most in importance. Given the rapid changes in computers and technologists' need to be comfortable working with them, it is not surprising that both the ability to input data and knowledge of software programs were selected as *more important*. Similarly, the increased clarity of MRI has meant that technologists must learn to interpret these new images, and must know both cross-sectional anatomy and the characteristics of normal and abnormal tissue. In addition, understanding the technical aspects of magnetic resonance itself has become central to the profession as the technology continues to improve and change. Consequently, technologists said that knowledge of physics and MRI technology have become *more important.*

Moreover, most respondents viewed interpersonal skills as more important now than they were five years ago. Two factors may have contributed to this finding. First, strong interpersonal skills are closely linked to effective patient care, especially when dealing with seriously ill individuals. MRI techniques have been applied to diagnose a wider range of serious illnesses, and technologists must use well-developed interpersonal skills in order to gain patient cooperation and achieve images that are technically correct and do not need to be repeated. Second, stand-alone MRI centers must compete for business, increasing the importance interpersonal skills plays in developing good rapport with patients and physicians.

Even though respondents said that interpersonal skills have changed over the past five years, they did not believe that administrative skills have gained as much in importance. In fact, they indicated that the latter skills have become only *somewhat more important.* Because most of these skills have not been affected by technology, the rate of change has not been as rapid as for other areas described. For example, the ability to keep detailed records requires the same basic knowledge today as it did five years ago, whereas knowledge of software programs is a skill that has greatly changed over this time period.

Responding to Industry Needs in Medical Imaging Occupations

In most jobs the skills necessary for successful and productive performance result from a combination of individuals' formal education, work experience, and on-the-job training. The pool of appropriately skilled employees for these positions is shaped by the number of students completing various educational programs and the subsequent work experience that they receive. However, at the entry level, formal education can be one of the most significant factors in determining employees' job qualifications and performance levels. Consequently, when employers seek to fill entry-level openings, they typically rely heavily on educational institutions to produce sufficient numbers of graduates with the appropriate types of skills.

The following sections of this report address the questions of whether or not staffing needs of the Bay Area health care industry for medical imaging professionals are being met by local educational institutions and if they are likely to be met in the future. Recent supply and demand patterns for each of these imaging fields in the Bay Area and elsewhere are presented to provide a background for these labor market assessments. However, because there is scant quantitative data on MRI professionals, this field is excluded from the discussion.

Projected Supply and Demand and the Adequacy of Educational Opportunities

Overview

Nearly all of the medical imaging occupations included in this study have experienced rapid growth in recent years and are expected to display average to much-greater-than-average growth in the next ten years (Bureau of Labor Statistics, 1988). The sole exception to the pattern is among EKG technicians, where improved productivity and hospital cost containment programs are likely to constrain growth substantially.

Several factors will contribute to the growth of these imaging occupations and, although the specific influences vary somewhat for individual occupations, they generally apply to the entire imaging field. These influences include the changing demographics of the American population, further technological advances, and research that identifies entirely new applications for existing technologies.

Many imaging technologies such as MRI, diagnostic radiography, nuclear medicine, and radiation therapy provide important tools for diagnosing and treating cancer or other conditions. The continued aging of the population, along with other factors, will produce a growing incidence of cancer and a greater demand for these imaging procedures. In addition, because of their precision and effectiveness, some technologies such as MRI and ultrasound will replace existing diagnostic techniques, and they will be used more frequently because they are invaluable to accurate diagnosis. With technological advances occurring in these fields, their diagnostic precision will be further refined and their use expanded. Finally, new developments in areas such as biotechnology are expected to create entirely new methods for using imaging technologies (e.g., nuclear medicine) as a treatment mode. All of these trends suggest that the recent high demand for professionals in most medical imaging fields is likely to be surpassed by even greater demand in the future.

However, other factors will potentially moderate the rate of growth in demand for personnel in medical imaging occupations. First, limiting the use of some diagnostic procedures has already been suggested as a way to control health care costs. At a minimum, implementing these proposals would slow the growth rate for imaging diagnostics. Second, continued improvements in technology are likely to improve productivity by decreasing the amount of time that is required to complete a diagnostic procedure or treatment, as well as reduce the number of scans that must be repeated. This enhanced productivity would, in turn, decrease the numbers of personnel needed in medical imaging jobs.

EKG Technicians

In the recent past the balance between supply and demand for EKG technicians in the Bay Area has varied significantly, depending on technicians' skill levels. Individuals with advanced knowledge, including echocardiography skills, have been in short supply, whereas those with only limited entry-level skills have been abundant in the labor market (Bay Area Council, 1990, p. 28).

The shortage of technicians with advanced skills may continue into the future. Relatively few EKG training programs exist in the Bay Area today, with only one program being offered in the community college system and one available through adult education. Virtually all EKG training is offered by hospitals, thereby limiting access to the small numbers of individuals who know about these opportunities. In addition, employers who experienced difficulty hiring technicians with advanced skills indicated that the scarcity of echocardiography training programs was a contributing factor because this specialized training has become an increasingly important hiring criterion (Bay Area Council, 1990, p. 28).

However, the entire labor market for EKG technicians may be shifting. The Bay Area Council study indicated that technicians who use only limited, entry-level skills may disappear from the work force, since many health care workers in other fields can learn to perform the basic EKG in a short period of time. Consequently, professionals in areas such as respiratory therapy could be cross trained to meet the need for basic EKG skills.

Results of this study tended to confirm findings from the Bay Area Council research. Among the thirteen EKG technicians responding to our survey, only one had graduated from an EKG training program. All of the other respondents had learned this technology on the job. Employer representatives who provided input to the study also confirmed that cross-trained employees were being recruited to meet current staffing needs.

Nuclear Medicine Technologists

In the Bay Area and nationally, the demand for nuclear medicine technologists is expected to increase only modestly over the next decade. The Institute of Medicine (1989, p. 136) projected an average annual increase of 1.6%, while annual growth in the Bay Area should be of the same magnitude (Bay Area Council, 1990). The Bureau of Labor Statistics (1988) described growth in demand for nuclear medicine technologists as slightly greater than average and indicated that competing factors would variously constrain or increase demand.

Constraining factors include the use of less invasive diagnostic methods such as MRI and computer tomography, and physicians ordering fewer tests as a result of cost containment efforts. However, factors that could increase demand include advances in medical diagnostics such as the use of monoclonal antibodies in conjunction with radionuclides or the use of radionuclides in cardiology to test the heart at work and at rest. In addition, applications of nuclear medicine today are largely diagnostic, and future research advances could expand the therapeutic applications of this technology.

The Department of Labor indicated that the supply of nuclear medicine technologists has varied widely, with hospitals in large urban areas experiencing little difficulty attracting qualified technologists, whereas rural areas have been forced to actively recruit technologists. On the whole, the supply of technologists grew rapidly during the 1970s, but declined in the mid- and late 1980s, leading to widespread recruitment difficulties by 1989 (AHRA, 1989). Larger hospitals in the Bay Area appear to have had an adequate supply of nuclear medicine technologists, consistent with Department of Labor data for the country as a whole.

The future balance between supply and demand among nuclear medicine technologists will be affected by the currently unknown impact of constraining and demand-enhancing factors discussed above. However, elimination of the current, although localized, national shortage will depend on reversing the declining number of nuclear medicine technology programs nationwide, as well as reversing the decrease in the number of students taking the nuclear medicine registry exam (AHRA, 1989, p. 6).

A similar assessment of the future applies to the San Francisco Bay Area. Only thirty additional nuclear medicine technologist positions are projected to open up in this area between 1987 and 1995 (Bay Area Council, 1990). However, currently only one nuclear medicine technology program (at the University of California at San Francisco) is offered locally. This program may be sufficient to meet current demand levels, but new applications of the technology could produce a need for additional training opportunities.

Diagnostic Radiologic Technologists

In contrast to EKG and nuclear medicine technology, there is likely to be substantial growth in the demand for diagnostic radiologic technologists, or rad techs, over the next decade. The U.S. Bureau of Labor Statistics indicated that demand for rad techs will grow from 115,400 to 190,100, an increase of sixty-five percent (Institute of Medicine, 1989). Most of this growth, from twenty-seven to thirty-eight percent of the total rad tech work force, will occur in physicians' offices. Largely because of an aging population and the extensive use of radiologic methods to diagnose cancer, demand for rad techs will increase. However, federal health care cost containment measures will be the major reason for the shift from hospital- to office-based services.

Projected increases in demand for rad techs will continue recent trends in this field, where demand has far outstripped supply. Several factors have contributed to this supply/demand imbalance. The number of radiography training programs in the United States decreased twenty-three percent between 1976 and 1986, although actual labor supply was not markedly affected until the final two years of this period, when the number of graduates fell from 7,393 in 1985 to 6,400 in 1986 (Institute of Medicine, 1989, p. 140). Number of programs declined an additional eleven percent by 1989. In addition, on average, rad tech programs have enrolled less than sixty percent of their potential capacity. Not surprisingly, AHRA (1989) data indicated that there was a severe shortage of qualified techs.

The Bay Area is likely to experience a similar shortage to that occurring nationally. The Bay Area Council (1990) predicted an increase in local demand from 2,720 in 1987 to

3,200 in 1995, which represents an average annual growth rate of 2.25%. Also similar to the national situation, growth will be much greater in outpatient settings than in hospitals.

There are six Bay Area programs that offer training in diagnostic radiologic technology. This is a greater number than that for any of the other medical imaging specialties. However, the Bay Area continues to experience significant shortages of technologists, suggesting that existing programs are not sufficient to meet demand.

One educator who participated in this study commented on the national and Bay Area recruitment shortage by indicating that "there is a big shortage of people in imaging fields all over the country. [Health care employers] don't expect it to go away for at least five to seven years. Now, there is a twenty-five percent vacancy rate throughout the country. There were times when I graduated students who were searching for jobs, even on-call positions. [Now] virtually all my graduates have jobs. They can call their own shots." Furthermore, these comments were echoed by other respondents. One explanation given for this shortage was the fact that many rad techs moved into MRI or CT over the past five years, creating many vacancies, especially in entry-level rad tech positions.

Radiation Therapy Technologists

A summary of the labor supply and demand situation for radiation therapy technologists is virtually identical for diagnostic radiology technologists. U.S. Department of Labor data, Summit of Manpower survey statistics, and the 1990 Bay Area Council study uniformly indicated that radiation therapy technologists will also experience substantially increased future demand in the Bay Area and throughout the United States, and for the same reasons. In the Bay Area and elsewhere, shortages are very significant, and experts participating in this study indicated that increased future demand will only exacerbate this situation.

Radiation therapy technologists are a very small occupation, accounting for only five percent to ten percent of practicing radiographers. Although the number of therapy technologists is small, even this limited demand has not been met in recent years. In fact, Bay Area employers participating in this survey and health care facilities responding to the AHRA survey (1990) reported significant recruitment difficulties. In the Bay Area these employers attributed personnel shortages to the fact that there is only one local training program in the field, to the high cost of relocation to the area for technologists trained elsewhere, and to high turnover in the occupation.

In addition, like diagnostic radiologic technology, radiologic therapy programs nationwide have also experienced enrollments that are far below capacity. The Northern California program has been successful in meeting its enrollment ceiling, but only through vigorous recruitment efforts. In both the diagnostic and therapeutic applications, participants in this study indicated that lack of knowledge about the field and/or fear of working with radiation may have discouraged potential students and contributed to these low enrollments.

Ultrasound Technologists

The Bureau of Labor Statistics (1988) has indicated that the range of applications for ultrasound technology is expected to grow very rapidly, especially in the areas of cardiology and obstetrics/gynecology. Health care employers participating in this study affirmed this future projection for the Bay Area. As a result, more widespread use of ultrasound tests will spur the demand for trained diagnostic medical sonographers.

To date, the labor market for diagnostic sonographers has diverged from that in many other imaging fields, with little evidence of severe personnel shortages. Nationally, AHRA (1990, p. 5) figures for vacancy rates ranged from nine percent to seventeen percent, and participants in this study did not cite high vacancy rates in the Bay Area as a significant staffing problem.

The supply pipeline for trained sonographers also appears to have been adequate in recent years. Nationally, very few states responding to the Summit on Manpower survey indicated recruiting problems, and their recruitment experience was better than that of programs in any other imaging occupation. Locally, the single ultrasound program offered outside of hospital training programs has experienced no difficulty in recruiting students. Moreover, in sharp contrast to other imagining specialties, new programs established in the future probably would not experience difficulties recruiting students. The Director of a community college ultrasound program indicated that "our class size for the coming year is nineteen [students]. For those nineteen individuals who enrolled, we had over one-hundred-twenty qualified applications for those positions."

However, it is unclear whether or not the personnel supply will meet future demand, especially in the Bay Area. Experts responding to this study indicated that demand will probably keep rising because ultrasound is both safe and in many cases more cost effective than other techniques. For example, one study participant indicated that "an ultrasound examination runs from $150 to $500, depending on what it is and where it is done. If the same patient were sent to the big CT scanner or an MRI facility for tests that could [similarly] be answered by an ultrasound, you are looking at costs that run $700 to $1,500 per examination." Because only one Bay Area nonhospital program is widely available, it is possible that future demand will outstrip supply if significant expansion occurs in the use of this technology. On the other hand, hospitals may continue to provide extensive in-house training, obviating the need for additional public programs, even if demand increases.

Summary and Conclusions

In the Bay Area and elsewhere, many medical imaging occupations have experienced significant recruitment difficulties during the past few years. Increasing use of these technologies is expected to worsen the supply-demand imbalance in the future. Other occupations, like nuclear medicine technologists, have had a generally adequate supply, but may experience future shortages if new applications or technological advances increase personnel demands.

Respondents to this study strongly indicated that existing partnerships between the health care industry and educational institutions in the Bay Area have strengthened the quality of educational programs in the health care field. However, findings from this study suggest the need for greater efforts and more consistent regional planning, involving health occupations vocational educators and employers, to identify future staffing needs and plan the educational programs that will address these requirements.

Results of this research also suggest the potential value of coordinated planning across educational programs in different medical imaging occupations. Many technologists participating in the study indicated that their health care careers had followed a path across two or more imaging fields. While these occupations clearly possess significant bodies of specialized knowledge, results of our occupational skill analyses also showed that they share other skills and knowledge. Basic sciences, patient care, and hospital administrative procedures are three major examples of these shared skill and knowledge areas. Coordinated programs could begin with efforts to identify the availability of trained imaging personnel interested in retraining for related fields. If these activities identify sufficient levels of potential student interest, programs could be developed that would shorten the time and reduce the cost for education in fields that are experiencing shortages.

MEDICAL THERAPY OCCUPATIONS

Introduction

This section presents findings on the changing skill requirements in three medical therapy occupations based on analyses of primary data collected explicitly for this study and on recently published research conducted by other health industry analysts. The primary data included fifteen hour-long structured interviews with experts in physical and respiratory therapy; two-hour focus group meetings conducted separately for each of the two therapy fields; and survey responses gathered from thirty respiratory therapists, twenty-eight physical therapists, and ten physical therapist assistants employed in San Francisco Bay Area hospitals and HMOs. A complete description of this research methodology is described in the third section.

This discussion of medical therapy occupations begins with an overview of the changing job responsibilities and work environments that have emerged in respiratory care and physical therapy in recent years and is followed by an analysis of changes in the education and credentialing requirements in these two fields. These discussions provide the background necessary for an examination of occupational skills requirements in respiratory and physical therapy.

The following units describe the study's findings concerning skills required for entry-level positions and for advancement in these occupational areas, and report the changes that have occurred in required skills. The later units of this section focus on the extent to which Bay Area educational programs have met industry labor force requirements for respiratory therapists, physical therapists, and physical therapist assistants; describe those specific areas where study participants identified skills deficiencies; and, finally, explain the implications of these findings for the future needs of the health care industry in the Bay Area and in other regions of the country.

Occupational Overview

The medical therapy field encompasses one of the more diverse clusters of allied health occupations. Professionals employed in these jobs work in a wide range of settings and provide medical services to individuals with many kinds of conditions. However, the therapy occupations share a common set of duties and responsibilities, all revolving around the treatment and rehabilitation of patients. Specifically, therapy professionals treat and rehabilitate patients with physical and mental disabilities or disorders; develop or restore functions; prevent loss of physical capacities; and maintain optimum performance. Practitioners in these occupations use a wide variety of different treatments. In physical and respiratory therapy these treatments include exercise, massage, heat, light, water, electricity, and specific therapeutic apparatuses. Moreover, they may participate in medically oriented rehabilitative programs, including educational, occupational, and recreational activities (Employment and Training Administration, 1977). Patients receiving treatments from therapists are usually referred by a physician.

The medical therapy occupations include audiologists, speech pathologists, coordinators of rehabilitation services, occupational therapists, physical therapists, manual arts therapists, recreational therapists, art therapists, music therapists, industrial therapists, orientation therapists for the blind, physical therapist assistants, corrective therapists, and occupational therapy assistants. From this large group of occupations, we selected three classifications for intensive analysis in this study: respiratory therapist, physical therapist, and physical therapist assistant.

Important similarities and differences exist across these three occupations. In particular, respiratory therapy and physical therapy both focus on observing, diagnosing, and treating physical or respiratory disabilities caused by accidents, disease, or genetic defects. However, respiratory therapists normally confine themselves to treating disabilities associated with heart and lung problems. Specifically, they work with patients suffering from emphysema, asthma, or other breathing difficulties. In contrast, physical therapists primarily focus on treating individuals suffering from disabilities of the muscular, nervous, cardiopulmonary, or skeletal systems. Consequently, physical therapists and physical therapist assistants would, for example, treat patients suffering from broken legs, strokes, or various congenital musculoskeletal conditions.

All of these occupations met our selection criteria for inclusion in the study, as described in detail in the third section. In each occupation, substantial work force growth is projected both nationally and in the Bay Area, and current personnel shortages exist that are predicted to continue. Furthermore, in each occupation major changes have occurred due to social and economic trends, which have shifted work responsibilities and altered the work environment. The two physical therapy occupations were also included in this analysis because of our interest in identifying potential career paths, barriers to mobility, and opportunities for advancement in health care occupations that could be achieved through articulated educational programs.

Changing Job Responsibilities

Respiratory Therapists

The duties and responsibilities in this field have changed considerably over the past fifteen years. Until the mid-1970s, respiratory therapists were generally known as "inhalation therapists," and their main function was to bring ventilators to the patient's bedside. Over time these functions have expanded to include a wider range of treatment methods and a much greater evaluative role. Today a respiratory therapist can use many different techniques to open up a patient's airways. In addition, many treatment methods go beyond opening airways and are used to medicate the patient.

Currently, respiratory therapists have substantial latitude in selecting the appropriate treatment modality for their patients, which may include using certain types of ventilators, aerosol sprays, oxygen therapy, drugs, or techniques such as teaching the patient how to cough correctly. The job responsibilities of respiratory therapists also have expanded into diagnostic functions. For example, especially in smaller hospitals, employers have increasingly sought respiratory therapists with knowledge of EKG and pulmonary function testing because cross-trained therapists offer greater staffing flexibility (Bay Area Council, 1990, p. 39).

Physical Therapists

The technical job responsibilities of physical therapists have changed somewhat less dramatically than those of respiratory therapists. For many years physical therapy practitioners have been responsible for evaluating and treating patients who require rehabilitation and are often referred to them by physicians. All of the physical therapy modalities emphasize restoring mobility and/or reducing pain, and some of the most basic and frequently used ones—such as heat, cold, and whirlpool and manual treatments like traction, therapeutic exercises, mobilization, and massage techniques—have remained unchanged over the years.

With the introduction of techniques such as ultrasound and electrical stimulation, the therapeutic number of treatment modalities has grown. In addition, more subtle shifts have occurred in the extent to which some traditional treatment methods are used. For example, as physical therapists have gained more technical knowledge of physiology and biomechanics, the effective use of more definitive mobilization techniques has become even more important in achieving treatment success.

Several larger societal trends have broadened the arenas in which physical therapists work. For example, physical therapists are responsible for teaching the disabled how to provide self-care and function better in their daily lives, and with today's increased emphasis on independent living and rehabilitation, this aspect of the physical therapist's role has been expanded. In addition, as physical therapists are and will continue to be treating increasing numbers of older people, their instructional capacity may assume even greater importance in the future. The growing emphasis on disease and disability prevention has also spawned a growing demand for physical therapists, especially in industry settings. Finally, the burgeoning emphasis on fitness has created a corresponding increase in sports medicine.

Physical Therapist Assistants

Working under the direction of physical therapists, physical therapist assistants (PTAs) prepare patients for treatment, assist in their treatment, train patients in exercise routines, and observe and report patients' progress. In many practice settings the job responsibilities of PTAs have changed significantly as they have learned a wider range of treatment methods. For example, in some settings PTAs now provide orthopedic and neurological treatment—areas that previously were not a part of their job responsibilities.

However, the role of the PTA varies substantially across institutions and depends primarily upon the philosophy of the institution and that of the physical therapist directing the assistant.

PTAs are not trained in evaluation; therefore, they only treat patients previously seen and evaluated by a physical therapist who has already established a treatment plan. PTAs perform most of the basic treatments that the physical therapist provides, including using the various modalities (application of heat and cold, electrical stimulation, ultrasound, whirlpools) and exercise and therapeutic routines (transfer training and gait training). However, the more complex technical tasks such as more advanced neurological and orthopedic treatments are often performed by physical therapists. The assistant may contribute somewhat to the assessment of treatment effectiveness, but the final decisions are always made by physical therapists.

Although they treat different conditions, use different treatment methods, and have acquired separate and specialized knowledge, in their jobs both physical and respiratory therapists apply common areas of basic scientific information which have not changed over time. Like respiratory therapists, physical therapists must know how the cardiopulmonary system works and must have a solid background in pathology and physiology (American Physical Therapy Association [APTA], 1990, p. 6). Conversely, beyond an extensive knowledge of the cardiopulmonary system, respiratory therapists are also required to study human anatomy and physiology, although not at the same advanced levels as physical therapists.

In addition to shifting job responsibilities, all three therapy occupations analyzed in this study also share a trend toward increasing complexity over the past twenty years. As a result, they have also become more specialized. While traditionally most therapists acquired sufficient knowledge to practice all of the treatment methods in their field, growing numbers of both respiratory and physical therapists have studied for advanced certifications and have specialized in one area. For respiratory therapists a specialty might be either blood gas monitoring and analysis or pulmonary functioning; while for physical therapists a specialty might be sports medicine, orthopedics, or pediatrics.

The Work Environment in Therapy Occupations

Respiratory Therapists

The work settings in which respiratory therapists practice have changed only slightly, with individuals in this field continuing to work almost exclusively in hospitals. According to a 1990 study, ninety-two percent (1,280 out of a total of 1,390) of respiratory therapists in the Bay Area worked in hospitals in 1987, while six percent worked in outpatient care (Bay Area Council, 1990).

However, it is possible that the number of respiratory therapists working outside of hospital settings will rise slightly over the next ten years. In fact, one respiratory therapist interviewed for this study indicated that a small proportion (5% to 10%) of his students are interested in pursuing home health care, and he predicted that within the next ten to fifteen years, respiratory therapists will follow the precedent set by physical therapists and begin to open their own clinics. The continued aging of the American population, coupled with new therapeutic applications for respiratory treatments, could also lead to an increase in respiratory home care and practice in long-term care facilities.

Physical Therapists

Over the past twenty years physical therapists have encountered a gradual change in their work settings. Most significantly, large numbers of physical therapists have left hospitals and entered private practice. To illustrate this trend in the Bay Area, a physical therapist in Oakland, California who participated in this study indicated that fifteen years ago there were only four physical therapists in private practice in that city, but said that today "there are too many to count."

Clinics were not the only new setting where physical therapists relocated. These professionals also moved in relatively large numbers into nursing homes, home health agencies, schools, and hospices (APTA, 1990). A study conducted in October, 1990, by the Bay Area Council and the California Economic Development Department documented this change. It reported that in 1987 only forty percent (570 out of a total of 1,380) of the physical therapists working in the Bay Area practiced primarily in hospitals.

Many factors have contributed to physical therapists leaving hospitals, some of which resulted from the larger social and economic trends described in the second section. Again, to summarize these trends,

- Physical therapy partially moved from acute care to other facilities as it became less expensive to provide health care in clinics than in hospitals;
- A growing older population required long-term treatment, including rehabilitation, which could be offered at lower cost in nursing facilities; and
- Increasing adult participation in sports led to more physical therapy treatment for sports-related injuries.

In addition, the option of employment outside of hospitals has become very appealing to some physical therapists. Several therapists interviewed for this study stated that private practice often provides more flexible work schedules, and usually these positions offer better pay. This added flexibility and compensation were probably strong motivators for a number of physical therapists to seek clinic practices.

One significant consequence of this shift in the work environment for physical therapists has been their high level of independence from direct supervision by physicians. Although reimbursement for therapy services generally remains contingent upon a physician referring a patient for treatment, during the course of that treatment, physical therapists control nearly all evaluation and assessment and make decisions about modalities. This independence created a need for more extensive knowledge of basic medical sciences and the broader implications of treating patients. The significance of this increased independence—and its dramatic impact on job responsibilities and required knowledge—was underscored by one study participant who had returned to physical therapy practice after a fifteen-year absence and felt that she was "practicing in an entirely new field."

Physical Therapist Assistants

This support occupation for physical therapy has also shown a parallel, but slightly more limited migration to nonhospital settings. Because PTAs are required by law to work under the direct supervision of a physical therapist, they have generally been confined to working in larger settings where they are not required to work alone for long periods of time. Consequently, many small clinics and hospitals do not extensively use PTAs.

Education and Certification Requirements

In both physical and respiratory therapy, trends toward legally mandated credentialing and greater specialization have emerged, accompanied by additional education requirements. However, for respiratory therapists and physical therapist assistants, these requirements remain highly variable across the nation. In contrast, more uniform licensing standards have been set for physical therapists.

Respiratory Therapy Credentialing

Increased specialization and advances in technical knowledge have produced more rigorous and diversified credentialing requirements. For example, The National Board for Respiratory Care (NBRC) now offers four separate credentials within the field. Candidates can receive a credential by passing an examination in one of the following: entry-level respiratory therapy practitioner, advanced respiratory therapy practitioner, entry-level pulmonary function technologist, or advanced pulmonary function technologist (NBRC, 1989, p. 3).

However, although licensing requirements for respiratory therapists have increased substantially in recent years, they are not uniform nationwide. California is one of a minority of states (Institute of Medicine, 1989, p. 239) that require licensure of all practicing respiratory therapists, which can be obtained through the State of California Respiratory Care Examining Committee.

The candidate obtains the basic California license, known as the Respiratory Care Practitioner (RCP), by passing the California certification. California and other states requiring licensure use the same exam as that offered by the National Board for Respiratory Care, which issues a Certified Respiratory Therapy Technician (CRTT) credential (NBRC, 1989, p. 4). This allows for reciprocity between states. To be eligible for the exam, individuals must hold a high school diploma or its equivalent and must have graduated from a one- or two-year respiratory care program that has been recognized by the Joint Review Committee for Respiratory Therapy Education and CAHEA (Respiratory Care

Examining Committee, 1989, p. 11). The RCEC will usually accept a certificate from any program that is approved by these organizations.

Respiratory therapists may also obtain advanced credentials from the NBRC. Although these are not mandated for practice by the RCEC, the advanced credentials are often required by hospitals as prerequisites for certain specialized positions. In a typical career progression, after passing the first exam as a respiratory care practitioner, a respiratory therapist will take the Registered Respiratory Therapist (RRT) exam, which contains both a written test and clinical simulation problems (NBRC, 1989, p. 5).

The NBRC (1989) requires that candidates for this Registered Respiratory Therapist credential have at least one of the following:

- Certified Respiratory Therapy Technician (CRTT) credential with a certificate of completion from an accredited two-year respiratory therapy program; or
- CRTT credential with four years experience as a respiratory therapist, in addition to sixty-two semester hours of college credit including the basic sciences; or
- CRTT credential with a baccalaureate degree in an area other than respiratory therapy, including college-level basic sciences, as well as two years of practice as a respiratory therapist.

The NBRC also offers two examinations in pulmonary function technology. The Certified Pulmonary Function Technologist (CPFT), the entry-level exam, requires a CRTT credential and two years of experience in the area of pulmonary technology. The Registered Pulmonary Function Technologist, an advanced-level exam, requires a CPFT credential for eligibility (NBRC, 1989, p. 8).

Physical Therapy Credentialing

Physical Therapists

Similar to respiratory care, physical therapy has also become more specialized due to the greater amount of knowledge necessary to practice in the field and expanded treatment methods. This trend toward specialization has produced seven recognized specialties for certification from the American Board of Physical Therapy Specialties.

The field of physical therapy has enforced highly uniform licensing and education guidelines throughout the country. Physical therapists must be licensed in all fifty states (Institute of Medicine, 1989, p. 237). In California, for example, before obtaining this license, applicants must pass a written exam administered by the Physical Therapy Examining Committee in order to qualify as a Registered Physical Therapist (Physical Therapy Examining Committee [PTEC], 1989, p. 1). To qualify for this exam, a candidate must have completed a minimum of four years of postsecondary education and have earned either a B.S. or M.S. degree in physical therapy, or a baccalaureate degree in another field combined with a certificate in physical therapy from an accredited institution (p. 2).

Out of all the occupations examined in this study, the sharpest increases in mandated education and credentialing have occurred among physical therapists. Today, in addition to meeting other credentialing requirements, physical therapists are required to hold baccalaureate degrees, and it is likely that the requirements for entering the field will be raised in the future. In fact, it has been predicted that by 1995 an M.S. in physical therapy will be required for all entry-level practitioners. Moreover, the American Physical Therapy Association (APTA) reported that the majority of colleges and universities have already begun to switch their programs from the B.S. to the M.S. level. Currently, no baccalaureate-level physical therapy programs remain in Northern California. Information gathered from the interviews and focus group discussions during this study and from existing analyses of education for physical therapy indicated that this change can be attributed to several factors:

- Expanded knowledge of medical technology and terminology;
- Growing specialization;
- More autonomous practice; and
- Recognition that existing baccalaureate-level physical therapy programs already required an average of five years to complete.

Beyond licensure as a Registered Physical Therapist, physical therapy professionals may also earn certification in seven specialty areas: clinical electrophysiology, geriatrics, cardiopulmonary, neurology, orthopedics, pediatrics, and sports physical therapy. These specialty certificates require further testing by the American Board of Physical Therapy Specialties and usually require advanced clinical experience or education (APTA, 1990).

Physical Therapist Assistants

Licensure for PTAs is not uniform nationwide, and only a minority of states hold this requirement. However, California is one of the few states that does require licensure. In California, candidates must pass a written exam offered by the Physical Therapy Examining Committee, and hold an A.A. or A.S. degree from an APTA accredited institution, although in some cases the degree requirement can be waived based on equivalent education and experience as a Physical Therapy Aide. Presently APTA does not offer any advanced or specialized certificates to PTAs, although many experienced PTAs do specialize in an informal manner.

Changing Skill Requirements in Medical Therapy Occupations

Introduction

Results of this study indicate that changes occurring in the medical therapy occupations have had a significant impact on the skills required in these jobs. With pressure to control costs, new technologies, expanded medical knowledge, movement beyond the hospital setting, and persistent labor shortages, therapists have been required to broaden their knowledge base and increase their skill levels.

Both technical and nontechnical knowledge and skill requirements have been indirectly affected by these trends because they have changed and expanded a wide variety of job duties. For example, cost control efforts and demographic trends have increased the extent to which therapists work autonomously, perform evaluative functions that were not previously required, and need to communicate more effectively with diverse groups of patients and other medical professionals. These expanded duties and responsibilities depend largely on some technical and nontechnical skills that were always important, but now are increasingly so.

Many of the changes occurring in these fields have also created the need for therapists to acquire knowledge in new areas, particularly in those related to specialized treatments. In particular, findings from this research indicated that in both respiratory and physical therapy, new technologies have increased the importance of knowledge about current treatment methods and new applications of existing technologies.

However, although our findings for these two therapy fields showed significant similarities, in many cases the knowledge and skills that have become more important in recent years differed. Most obviously, because respiratory care is more heavily dependent on technology, this field experienced a sharper increase in the importance of technology-related knowledge than did physical therapy. Conversely, because physical therapists are more likely than respiratory therapists to practice in independent clinic settings, knowledge and abilities that relate to small business management, general management and supervision, reimbursement, and other administrative requirements have become more important to this group than to respiratory therapists.

Among PTAs, the most significant increases in skill requirements involved communication and administrative skills and treatment knowledge. These shifts may reflect the increased responsibilities of PTAs due to their expanded role in a cost-control environment and shortages of physical therapists. Moreover, the growing importance of administrative skills may reflect existing legal constraints on treatment responsibilities of PTAs, and the resulting emphasis on nonregulated administrative functions.

The following discussion presents more detailed findings from the hospital surveys on skill requirements in respiratory therapy, physical therapy, and physical therapist assistant jobs. These surveys represented the culmination of two earlier data gathering activities including in-depth interviews and focus group meetings with experts in these fields.

For the purpose of the surveys, skills, knowledge, and ability in therapy occupations were grouped into four categories: Assessment and Diagnosis, Treatment, General Knowledge, and Administrative and Communication Skills. For each skill, knowledge, and ability, survey respondents used a five-point scale to indicate how important that area was for entry-level job performance; how important it was for advancement; and how the skill had changed in importance over the past five years. Appendix B contains the complete results of the surveys for the three therapy occupations.

The four skill, knowledge, and ability categories are defined as follows:

1. *Assessment and Diagnosis:* skills that are directly related to understanding the meaning of patient symptoms and evaluating and interpreting test results. This category also includes the ability to interpret readings on various monitors and diagnostic equipment.

2. *Treatment:* skills that are directly necessary to provide the various types of patient treatments that are required for the job, including knowledge of why the treatments are necessary and how these treatments help patients.

3. *General Knowledge:* knowledge that is indirectly related to the daily care of the patient, but necessary for the therapist to provide effective assessment, diagnosis, and treatment. These include, for example, knowledge of general anatomy, physiology, and disease pathology.

4. *Administrative and Communication:* skills, knowledge, and abilities that are used by the therapist to interact with others (patients, coworkers, and supervisors) in the hospital and those skills that are used in a managerial or supervisory capacity.

For analyses of skills that were important for entry-level job performance and for advancement, findings were grouped into four levels: (1) *very important*, (2) *moderately important*, (3) *somewhat important*, and (4) *not important*. With respect to changes over time, skills were grouped into *much more important*, *more important*, *somewhat more important*, and *not more important*.

The following sections present the patterns of skills that emerged from these survey findings.

Occupational Skills for Respiratory Therapists

Overview

The *Allied Health Education Directory of 1990* (Gupta & Hedrick, 1990) defines respiratory therapy as a job in which the practitioner may have the following responsibilities:

- Initiate and conduct therapeutic procedures and modify these procedures if necessary.
- Maintain patient records and communicate relevant information to other members of the health team.
- Assist the physician in performing special procedures in a clinical laboratory, procedure room, or operating room.
- Review, collect, and recommend gathering additional data to evaluate the appropriateness of the prescribed treatment plan.
- Select, assemble, and check all equipment used in providing respiratory care.

Respiratory therapists fulfill many of these major job responsibilities by using various respiratory technologies. All of these responsibilities, including communicating with other health professionals about patients' conditions and treatments, require the respiratory therapist to use and understand technology. Even maintaining patient records has become dependent on new technologies because hospitals have implemented computerized record-keeping systems. However, the understanding of technology goes beyond basic knowledge of machinery and equipment and also includes the ability to make judgments about patients' conditions based on interpreting technical data in complex medical situations.

In addition, because the scope of the therapist's job has been expanded, these professionals now work more autonomously and, consequently, must exercise greater independent judgment. Since respiratory therapists are more frequently assessing and treating patients with reduced input from physicians, this is especially true. In fact, several experts who participated in this research indicated that with the introduction of new, more complex respiratory treatments, many physicians rely heavily on the evaluations and judgment of the respiratory therapist, even though the physicians themselves usually make major decisions about which respiratory care procedures should be used.

Other major components of change in the skill requirements of respiratory therapists have been related to their increased autonomy—that is, the need for well-developed interpersonal skills and for additional administrative knowledge. The growing ethnic diversity of patients and health professionals in the Bay Area, the aging of the patient population, the greater medical knowledge of patients receiving hospital treatment, and cost control efforts have required therapists to have strong interpersonal and communication skills and accurate knowledge of administrative procedures.

Skills Important for Entry-Level Positions

Results of the hospital survey indicated that the skills required for entry-level respiratory therapy jobs are distributed across the four categories of skills, knowledge, and abilities. Overall respondents indicated that therapists are given a broad range of responsibilities early in their careers and, consequently, must have a combination of high-level cognitive skills and knowledge of specific job-related information. For example, in the survey *very important* skills included assessment and diagnostic skills requiring the ability to interpret information and make judgments; interpersonal and communication skills, especially for working with physicians and other health professionals and for developing relationships with patients; and the ability to perform administrative functions such as monitoring patients' conditions and keeping treatment records.

Basic and specialized scientific knowledge also emerged as *very important* for entry-level job performance. For example, in addition to knowledge of anatomy, physiology, chemistry, and physics, entry-level respiratory therapists needed to have a firm grasp of blood chemistry, pathology, cardiopulmonary anatomy, and respiratory physiology and anatomy. Knowledge of medical terminology was also a *very important* entry-level job skill.

Two categories of job skills that are generally important for experienced respiratory therapists appeared to be somewhat less important at the entry-level. These tended to be skills that were either important for advancement (e.g., supervisory skills and knowledge of reimbursement requirements) or highly specialized ones (e.g., skills in performing intubation, computer programming, and the ability to work in surgery.

Skills Important for Advancement

Advancement within respiratory care is less clear-cut than in some of the other allied health fields. There are no clearly defined career ladders, and individuals do not change job titles unless they move into certain specialty positions or management jobs. In general, respiratory therapists advance by obtaining more job responsibility and by becoming more specialized, as they gain additional knowledge and certifications such as the Registered Respiratory Technologist, the Certified Pulmonary Function Technologist, and the Registered Pulmonary Function Technologist. In addition, since it has become important to those who make staffing decisions in many hospitals that respiratory therapists acquire certain skills such as EKG testing, respiratory therapists are now more likely to increase their skills in areas outside of respiratory care. Consequently, especially in smaller hospitals, advancement may result when therapists broaden their responsibilities to include duties that were not traditionally part of respiratory care.

Many respiratory therapists work throughout their careers without changing job titles. However, the content of their jobs may change substantially, from implementing relatively simple procedures to later performing complex ones and serving in a supervisory or instructional capacity. Other individuals who advance in respiratory therapy may move into management positions where they combine technical and administrative responsibilities. It was clear from both interviews and survey data collected for this study that many therapists viewed administration as an avenue for advancement. Among those who answered the survey question, "What do you want your next job to be?" one-third of the respondents (eight out of a total of twenty-four) indicated they hoped to move into an administrative position.

Results of the hospital survey for respiratory therapists indicated that virtually all of the skills that were important for advancement were also vital for entry-level positions, along with two other skill areas: knowledge of specialized and technical areas of respiratory therapy and administrative and supervisory skills. For example, these specialized skills, knowledge, and abilities included the ability to conduct pulmonary screening exams, skills in neonatal intensive care, nasal ventilation, and high-frequency jet ventilation.

Interestingly, many of the skill areas that involve making judgments based on complex medical knowledge appeared to be *very important* both for entry-level jobs and for advancement. For example, at both levels the ability to determine when to take patients off of respirators and to assess the appropriateness of physicians' orders was important. These findings indicated that even in entry-level positions, respiratory therapists are required to exercise substantial judgment and to integrate complex information.

One final difference between entry-level and advancement-related skills was the importance of general communication, writing, and administrative skills. Not surprisingly, there was a larger number of administrative and communication skills that were *very important* for advancement than there were for entry-level job performance.

Skills That Have Gained in Importance

The technology-driven nature of respiratory care was apparent from the survey findings about skills that have become *more important* over the last five years. In fact, five out of the six skills that recently became *much more important* were related to technology, as were many of the skills that became *more important*. Technology-related items in the *much more important* category were the following:

- Ability to assist with cardiac catheterization;
- Ability to use digitalized ventilators;
- Ability to use pressure support ventilators;
- Knowledge of how to use different ventilators; and
- Skills in computer use.

The sole assessment and diagnosis item that emerged as *much more important* was the ability to determine if physicians' orders are appropriate. Some members of this project's advisory group were surprised that this skill even appeared on the survey questionnaire and questioned whether therapists actually evaluated physicians' orders. However, this item was included in the survey because respiratory care experts frequently mentioned it in their interviews. There was little ambiguity on this issue—survey respondents very clearly indicated that this skill had become *much more important.*

Two factors may account for this change. First, many respiratory therapists may actually be more knowledgeable than some physicians are about respiratory treatment alternatives and their implications because they keep up with the complex technological advances in this field. Moreover, respiratory therapy professionals indicated that in recent years they have gained more autonomy and have been able to make more therapeutic decisions, perhaps due to their highly valued knowledge of various treatments and how they affect patients.

Second, many hospitals have experienced increased patient loads, and nearly all hospitals have been treating patients who are more severely ill. These trends may have placed added pressure on staff physicians and may have shifted significant responsibility for respiratory treatment to technologists, who may have more up-to-date technical knowledge of respiratory care. In addition, such a shift would further reduce physicians' opportunities to learn about new technologies and would make them less aware of these treatment alternatives. Consequently, when evaluating physicians' orders, technologists may be assessing them in light of the newer approaches with which some physicians are less familiar.

Finally, the survey results indicated that several skills related to therapists' expanded essential responsibilities also became *more important* over the past five years. For example, these included knowledge of pharmacology, skill in neonatal intensive care, knowledge of how patients respond to life support systems, and the ability to work in home care settings. In the first instance, knowledge of pharmacology has become more important as new drugs for respiratory care have become available and more patients have required respiratory care while taking cardiac medication. Secondly, neonatal intensive care has become one of the growing specialty areas in respiratory therapy, and the rising use of life-support systems has required respiratory therapists to participate more in health care teams that treat patients on mechanical life support systems.

Occupational Skills for Physical Therapists

Overview

According to the *Occupational Outlook Handbook* published by the Bureau of Labor Statistics (1988, p. 143), physical therapists are normally responsible for

- Evaluating patients' physical conditions and needs.
- Developing a program of corrective exercise and treatment for assigned patients.

- Determining proper equipment usage, application, and body position.
- Recommending modification or changes in patients' programs based on their evaluations of patients' progress. Also, they may confer as necessary with physicians to discuss available alternatives.
- Preparing written documentation as required by the profession and the department such as evaluation results, treatment plans, and progress reports.
- Communicating observations, facts, and comments to other team members.
- Providing guidance and direction to those who are assigned to assist.

Nearly all the major social and economic trends affecting the health care industry have influenced both demand for physical therapy and the settings in which the profession is practiced. While an aging population and the growing involvement of individuals in sports activities has increased demand, cost containment efforts have shifted much of physical therapy practice to nonhospital facilities. Findings from this research on changing skill requirements parallel these practice modifications. Not surprisingly, therapists said they needed more sophisticated skills in the areas of treatment planning, small business management, reimbursement rules, and working autonomously. In addition, they also indicated a need for greater knowledge of geriatrics, sports medicine, and manual manipulation. This latter skills area reflected the growing influence of advances in orthopedics on physical therapy practice.

Skills Important for Entry-Level Positions

Findings from the hospital survey showed a broad range of entry-level skills that were important for physical therapists who were starting their careers. In general, respondents indicated that to practice effectively a beginning therapist must have all of the following: a good understanding of assessment methods and the ability to integrate assessment data in order to evaluate patients; a comprehensive knowledge of manual treatments and modalities; skill in applying the scientific principles underlying physical therapy practice; and the ability to work autonomously, sometimes supervise others, and communicate effectively with patients.

The survey results clearly indicated that the great majority of skills demonstrated by a *typical*[12] physical therapist are already required for entry-level job performance. Specifically, more than three-quarters of the skills gathered from the structured interviews with physical therapists later emerged in the hospital surveys as *very important* entry-level skills. This finding concerning the high level of skills that beginning physical therapists must have provides strong support for the requirement that physical therapists hold at least a baccalaureate degree in order to begin practice, and for the trend in many geographic areas toward requiring a master's degree.

Skills Important for Advancement

As in respiratory therapy, in physical therapy there is no single career path into higher level positions. Advancement in physical therapy can occur through promotion into supervisory or management positions, through certification and movement into a specialty field, or through working in a consulting or instructional capacity. Another career route that increasing numbers of physical therapists have followed is to establish an independent consulting practice in a private clinic. In fact, many of the management-level physical therapists who participated in this study combined several of these professional paths.

Survey respondents indicated that a high degree of overlap exists between the skills needed for advancement in physical therapy and those initially required for entry-level jobs. However, several skills that fell into the general administrative and supervisory area were less important at the entry level, but *very important* for advancement. In particular, these included knowledge of small business administration, knowledge of rules for reimbursement, and ability to train other physical therapists and assistants and to supervise aides and clerical staff. With increasing numbers of therapists establishing their own private practices and the expanding use of physical therapist assistants and aides, it was not unexpected that our survey results identified the importance of these business-related and supervisory skills, knowledge, and abilities.

Beyond administrative and supervisory skills, one treatment-related skill appeared to be *more important* for advancement than for entry-level work—the ability to conduct manual tests to determine the condition of tissues and joints. The emphasis that was placed on this treatment skill in the survey findings was noticeable because it was the *only* treatment technique that was *not important* at the entry-level, but was so for advancement. This finding suggested that advances in the field of orthopedics have significantly affected the type of skills needed by therapists, but that extensive work experience may be necessary to develop this treatment skill fully. A comment made by one physical therapist who was involved in this study further demonstrates the importance of this skill: "Anybody can use modalities, but only a good physical therapist can diagnose and treat a bad shoulder with his hands, feeling the muscle and tissue structures to understand what needs treatment and how to go about it."

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[12] *Typical* occupational skills are ones that were regularly mentioned during intensive job analysis interviews as necessary to perform typical job duties. These skills were used to generate the SKA lists upon which the hospital surveys were based.

Skills That Have Gained in Importance

The survey results indicated that from a total list of sixty-nine physical therapy skills, only one emerged as *much more important* over the past five years. This single category, skill in applying manual manipulation techniques, also received the highest ratings with respect to importance for entry-level positions and for career advancement. We interpret this finding as further evidence of the significance of advances in orthopedics on the practice of physical therapy.

Aside from the growing emphasis on manual manipulation techniques, survey findings on the skills, knowledge, and abilities that have become *more important* in the past five years did not show any clear pattern of increasing importance for three out of the four skill categories. Importantly, in contrast to respiratory therapy, which is heavily technology driven, there was no strong evidence that new treatment methods or technical advances have created new skill requirements. However, the findings indicated that assessment and diagnostic skills—including treatment planning—increased in importance, suggesting that physical therapists have had more need for the higher type of integrative, cognitive skills necessary for evaluative work.

Despite the lack of clear patterns in skill changes, some notable skill shifts were apparent. For instance, respondents indicated that some additional skills linked to changing population demographics, legislation, or other social trends had become more critical over the past five years. These included knowledge of geriatrics and therapies for older persons, ability to identify and recommend solutions for architectural barriers, and knowledge of sports medicine.

In addition, the trend of physical therapists moving from hospitals into clinic practices was also reflected in their responses about changing occupational skills. For instance, physical therapists increasingly needed to become knowledgeable about small business practices, third-party payer rules of reimbursement, and the ability to work without supervision.

Finally, the results from both fixed-response survey items and open-ended questions indicated a substantial pattern among physical therapists toward delegating responsibilities to assistants. That trend, which often resulted from cost containment efforts, required physical therapists to have more skill in supervising and training physical therapist assistants. Respondents' strong indications in open-ended questions that physical therapists needed more skills in administration to deal with financially and legally mandated paperwork requirements proved to be an additional effect of these financial factors.

Occupational Skills for Physical Therapist Assistants

Overview

According to *Health Care Occupations: A Comprehensive Job Description Manual* (Massachusetts Hospital Personnel Directors Association, 1985, p. 251), the principal duties of the PTA include

- Carrying out a program of corrective exercise and treatment for assigned patients, as determined by the physical therapist's evaluation.
- Under supervision, administering such treatments as exercise, gait training, massage, whirlpool, hot packs, diathermy, ultrasound, paraffin, ice packs, and traction.
- Instructing patients on segments of the program including proper use of wheelchairs, crutches, canes, braces, and prosthetic appliances and devices.
- Preparing written documentation as required by the department and directed by the therapist.
- Assisting in the care and maintenance of department equipment and supplies.

Physical therapist assistants clearly are not "junior physical therapists" who perform the same duties as therapists, but at a lower level. Especially in the area of evaluation and assessment, in many states assistants are excluded by statute from most activities related to evaluation or treatment planning (Lupi-Williams, 1983, p. 21; APTA, 1990, p. 11). Instead their role continues to be one of supporting the physical therapist in providing quality services.

As more states required licensing of PTAs based on more uniform educational and examination standards, and as hospital cost containment efforts expanded the role of health care support personnel, their responsibilities have become greater and more diversified in recent years. In some instances, the acute shortage of physical therapists required hospitals to expand the technical duties of PTAs, allowing them limited involvement in orthopedic and neurological work and increasing their administrative responsibilities for scheduling and keeping documentation for third-party payers. The focus group for physical therapy in this study indicated that expanding the administrative responsibilities of PTAs proved to be one of the most important ways in which these individuals could contribute even more to cost control efforts.

One important caveat is necessary in interpreting these results. Survey responses to the PTA questionnaire were limited in number because several hospitals indicated that they did not employ any PTAs since these individuals were impossible to recruit. However, we report the findings from the PTA survey because many of the results were supported by additional information gathered from the interviews and focus groups. Nevertheless, some observations, especially those related to expanded PTA responsibility for independent action, assessment, and work in neurological and orthopedic areas, may have limited generalizability.

Skills Important for Entry-Level Positions

The skills that are important for entry-level employment as a PTA range across all four skill categories, although, as expected, there were relatively few *very important* or *critical* skills in the assessment and diagnosis group. Overall, the *very important* entry-level skills demonstrated a need for comprehensive technical knowledge of treatment methods, a strong background in the basic sciences, and the ability to exercise judgment and work autonomously. This latter requirement was somewhat surprising, given the traditional and legal requirement that PTA work under the close supervision of a physical therapist. One way to interpret this finding is that PTAs have already assumed more responsibility for administrative areas, where close supervision is not mandated, and experienced PTAs can apply their knowledge of hospital procedures to this area. However, another interpretation is that the strictures of staff shortages may have caused the responsibilities of PTAs to expand beyond those mandated by statute.

The first of these interpretations—that PTAs have taken added responsibility for administrative tasks and have a concomitant need for strong written and verbal communication skills—was supported by other evidence from the fixed-format survey responses about entry-level skills requirements and from open-ended questions. Among the four skill categories, administrative and communication skill items were most likely to receive scores of "4" or "5" indicating that they were very important or critical. One respondent said that the major change occurring in the PTA's job over the past few years was the increase in paperwork and documentation related to Medicare and insurance forms, while another noted the need to improve skills related to documentation for third-party payers, as well as communication skills with social service professionals, nurses, and patients' families.

Skills Important for Advancement

Similar to respiratory therapy, in physical therapy no clearly defined career path exists where current programs offer additional education leading to promotion into a higher occupational classification. This may appear somewhat surprising, given the close working relationship between assistants and physical therapists and the fact that they use many of the same treatment modalities. However, PTAs are closely supervised by physical therapists, and their positions are viewed as much more technical and nearly devoid of assessment and evaluation responsibilities.

Physical therapist assistants are not usually on a career path toward becoming physical therapists. In fact, the program description offered by a Bay Area community college emphasizes this point by stating "although General Education requirements can apply toward a higher degree, the PTA Program is not intended as a lead-in to becoming a professional physical therapist." Reinforcing this point of view, focus group participants in this study indicated that few PTAs returned to school to become physical therapists, and our survey findings supported this assessment, with very few PTAs indicating that they planned to attend a physical therapy program.

Therefore, what is really meant by "advancement" for physical therapist assistants? Findings from our interviews and surveys indicated that many PTAs have specialized in an informal way, similar to the pattern that existed among the physical therapists with whom they work. In addition, they have assumed greater responsibility for both technical and administrative tasks. Specifically, survey respondents indicated that as they accumulated more experience, they were offered greater freedom, some input into initial patient evaluations, and added responsibility for administrative work. These open-ended responses were confirmed by findings from the fixed-response questions.

Skills That Have Gained in Importance

Survey responses, interviews, and focus group results indicated that both technical skills associated with treatment modalities and administrative and communication skills have become more important for PTAs over recent years. Heading the list of survey results on *much more important* treatment-related skills was that of analyzing patient symptoms and their responses to therapy—the only skill category where nearly all survey respondents indicated a shift toward *much more important* over the past five years. This finding suggests that PTAs may be assuming a broader role by discussing what they have observed during treatment and afterwards with the supervising physical therapists.

Additional treatment-related skill areas that have become *more important* were the following:

- The ability to choose modality or treatment procedures based on the therapist's diagnosis;
- Skill in applying manual mobilization techniques;
- Skill in applying electrical stimulation and knowledge of physical therapy;
- Knowledge of the therapeutic exercise appropriate for different illnesses, injuries, or diseases;
- Skill in problem solving;
- Knowledge of which tests are appropriate for patient treatment; and
- Understanding the legal and ethical parameters of practice.

Considering these skill items as a group, their growing importance suggested that although physical therapists retain primary responsibility for treatment planning, implementation, and evaluation, PTAs have been providing more input into these activities and, consequently, require more technical knowledge and higher level cognitive abilities.

The administrative and communication skills that have become *more important* for job performance included communicating verbally and in writing and assisting with the training of other PTAs and students—skills that underscore the expanding role of the PTA.

Responding to Industry Needs in Respiratory and Physical Therapy

The skills, knowledge, and abilities necessary for effective job performance are acquired through a combination of formal education, work experience, and on-the-job training. However, at the entry level, formal education is far more important than the other factors in shaping employees' capabilities. Consequently, when trying to fill these positions, employers rely heavily on educational institutions to turn out graduates who meet industry skill requirements and to provide enough individuals who are trained in various therapy occupations. Although efforts to recruit staff from other geographic areas and relocating professionals also affect the success of staffing programs, local educational institutions play an especially important role at the entry level.

The following sections address whether or not the staffing needs of the Bay Area health care industry for respiratory and physical therapy professionals have been met by local educational institutions; whether or not they are likely to be met in the future; and whether or not new employees have the skills that employers require. Moreover, recent supply and demand patterns in respiratory and physical therapy are presented to provide a background for these labor market assessments.

Respiratory Therapy: Recent Shortages and an Uncertain Future

Recent Patterns of Supply and Demand and Future Projections

National Trends. It is important to place the San Francisco Bay Area labor market for respiratory care professionals within the broader context of the national situation. According to one recent analysis, nationally the number of respiratory therapy programs increased thirty-four percent, from one-hundred-seventy-five programs in 1980 to two-hundred-thirty-five programs in 1986. However, a commensurate increase in the number of graduates did not occur. Over this same period the number of one-year respiratory therapy technician programs decreased, as part of a continuing phase-out of these less comprehensive programs (Institute of Medicine, 1989, p. 146). The net effect of these changes for therapists and technicians has been a shrinking supply of trained respiratory care professionals entering the market nationwide.

On the demand side, the amount of respiratory care provided appears to have increased, and the number of hospital admissions for individuals with respiratory-related diagnoses actually rose. Nevertheless, employment levels for respiratory care professionals declined. This pattern suggests that while demand may have remained stable, or even increased somewhat, productivity improvements allowed health care institutions to provide more respiratory care services with fewer professionals (American Association of Respiratory Care Professionals, 1986).

What do these recent trends suggest for the future? Health industry analysts indicate that nationally the future demand for respiratory therapists is uncertain and will depend upon several conflicting factors. These influences were identified in a recent Institute of Medicine Report (1989) based on Bureau of Labor Statistics projections. According to this report, several factors should heighten the future demand for respiratory care. For example, aging of the population should increase the amount of respiratory care for older, more chronically ill patients who are admitted to hospitals. Assuming that current productivity levels continue, expansion of respiratory care services to trauma victims, neonates, and cardiac care patients should also increase the demand for these respiratory therapy professionals.

However, one major potential area of expanded respiratory care service—movement into the home care arena—is expected to be limited, due to continuing and even more stringent reimbursement restrictions. In addition, Institute of Medicine analysts indicate that respiratory care has been targeted for more stringent control over unnecessary services, which will tend to curb growth. The combined impact of these factors is likely to produce an increase in the demand for respiratory care professionals, but only to a moderate extent.

Bay Area Trends. This national pattern of relatively balanced supply and demand has not emerged in all labor markets throughout the nation and definitely has not occurred in California or in the San Francisco Bay Area. In fact, throughout the state and in Bay Area counties, demand has consistently outstripped supply. In 1990, the California Employment Development Department found that employers have had difficulty finding experienced and registry-eligible therapists (Bay Area Council, 1990, p. 39). Results from our focus group of Bay Area respiratory therapy managers and educators also indicated that there have been more openings for new graduates than individuals to fill these positions. As an educator from one of the largest Bay Area respiratory therapy programs stated, "The job market is so open and the job availability is so great that all students (not only mine) have their choice about where they want to work."

Between 1986 and 1995, employment demand for respiratory therapists is expected to grow by fifteen percent (Bay Area Council, 1990, p. 39), indicating that demand is likely to remain strong. Also contributing to this demand is the fact that turnover among respiratory therapists is high. Focus group participants representing several Bay Area health care institutions indicated that many entry-level therapists leave the profession within the first five years of employment because of "a lack of respect for their work and a perceived lack of challenge on the job." Certainly our survey results confirmed this point. Nearly half of the thirty respiratory therapy respondents in this study indicated that they wanted their next job to be outside the respiratory care field, with many stating a preference for moving out of health care entirely.

High turnover is not a localized problem, with these rates averaging nearly eighteen percent annually for respiratory therapists throughout California (Logsdon & Beghin, 1988). Consequently, even moderately increasing demand coupled with high turnover rates may produce continuing and significant personnel shortages in the future.

Respiratory Therapy Program Availability in the Bay Area

With recent and projected shortages of respiratory therapists in the Bay Area, how effectively are local educational programs meeting these personnel needs? Currently public institutions in the Bay Area offer four respiratory therapy programs and one for respiratory therapy technicians. All the respiratory therapy programs are two-year programs provided through the California Community Colleges (Table 5). The California Department of

Education's Adult and Vocational Program offers the sole one-year respiratory therapy technician program.

Figure 4 shows the Bay Area locations of the California Community College system's respiratory care programs. Their distribution throughout the region is a good one, providing better access to training than programs in many other health care fields. Programs are offered in all major counties of the Bay Area, although students from San Francisco are required to travel to San Mateo County for some coursework in the program jointly offered by The San Francisco Community College District and San Mateo County's Skyline College.

Despite the fact that these programs are generally well located, they do have several major drawbacks for many potential students. All Bay Area respiratory therapy programs are full time, day courses of study. Consequently, despite their relatively good locations, these educational programs are not accessible to many individuals in one of the fastest growing segments of the California Community College population—older, returning students who must combine working during the day with attending continuing education classes at night. This is a particularly salient issue in the allied health field. In fact, all of our focus group results indicated that the most rapid growth in enrollments has occurred among older, reentry students.

In addition, currently there is no respiratory therapy program accessible to potential students from the predominantly minority urban areas of the East Bay. Focus group participants from throughout the Bay Area identified declining enrollments of black students in existing programs. They suggested that this trend might be reversed regionwide if a program were more accessible to areas such as Oakland and if part-time programs were available for students who must combine work with schooling. Finally, many students enrolled in the respiratory therapy program at Napa Valley Community College live in other counties. Our focus group discussions revealed that long commutes for these Napa students may have negatively affected their retention rates.

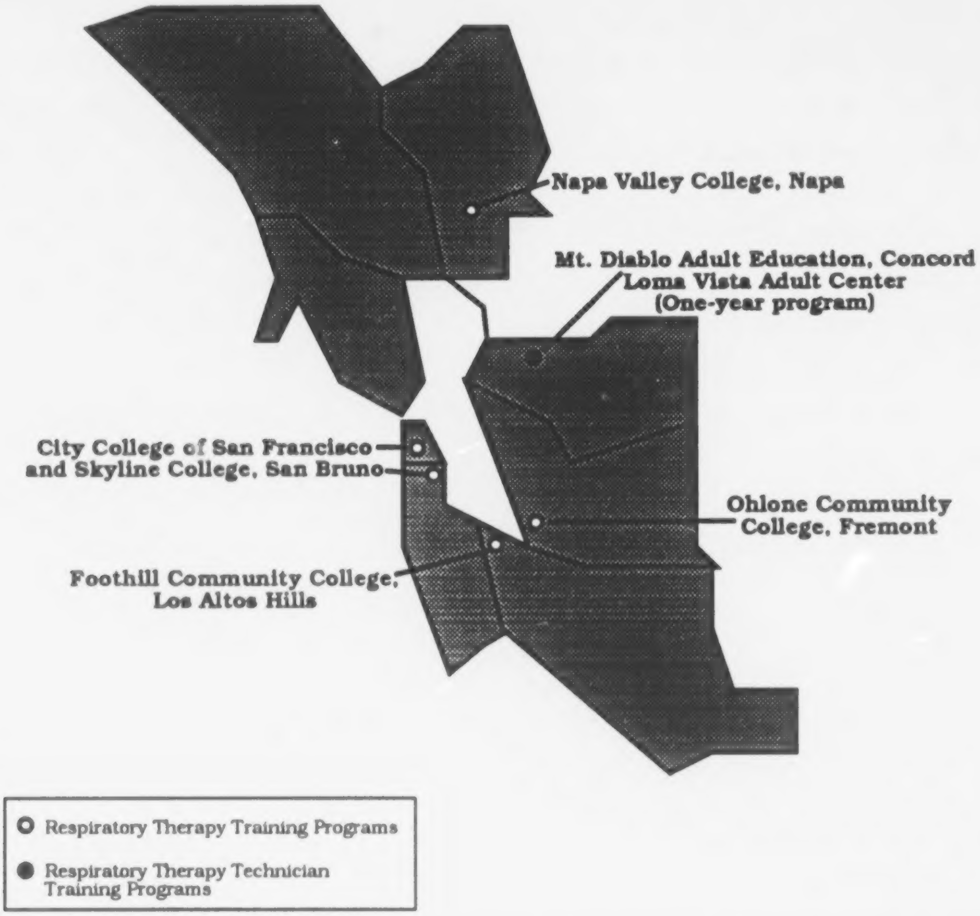
Evidence of recruitment difficulties among Bay Area hospitals indicates that despite generally full classes, the region's training programs are not creating a sufficient supply of trained respiratory care professionals. Focus group results suggested that some of this problem may be due to substantial attrition in respiratory therapy programs, running as

Table 5
Bay Area Respiratory Care Programs

Program	Institution	Location	Length of Program
Respiratory Therapy	Napa Valley College	Napa	2 Years
Respiratory Therapy	Ohlone College/ Diablo Valley College	Fremont	2 Years
Respiratory Therapy	Foothill College	Los Altos Hills	2 Years
Respiratory Therapy	Skyline College and S.F. City College	San Bruno San Francisco	2 Years
Respiratory Therapy Technician	Mount Diablo Adult Education	Concord	1 Year

Figure 4

Respiratory Care Programs in Northern California*


Napa Valley College, Napa
Mt. Diablo Adult Education, Concord
Loma Vista Adult Center
(One-year program)
City College of San Francisco
and Skyline College, San Bruno
Ohlone Community
College, Fremont
Foothill Community College,
Los Altos Hills
○ Respiratory Therapy Training Programs
● Respiratory Therapy Technician Training Programs

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*All programs are two-year programs unless otherwise indicated.

high as fifty percent in one local community college and averaging about twenty-five percent in others.

In summary, the supply of respiratory therapists to Bay Area health care facilities has been inadequate and may remain so in the future. Anticipated demand is probably sufficient to justify larger numbers of graduates. To alleviate these shortages, efforts such as developing night and part-time programs, assessing the potential for developing a new program in or near Oakland, and reducing attrition rates in existing programs would be positive initial steps.

The Match between Skill Requirements and Training

Data gathered in this study from interviews, focus groups, and survey responses provided evidence concerning the skill areas where new employees in respiratory care positions have displayed either adequate or insufficient educational preparation. In interviews with supervisory personnel, respiratory therapy experts were asked about areas where their newly hired employees showed good skill preparation and deficiencies. In addition, participants in the respiratory therapy focus group, which included eight department supervisors, managers, and educators, were also asked about areas of adequate and inadequate skills. Finally, all survey respondents were asked to indicate what skills or knowledge they needed to perform in their jobs, which they had not learned in school.

Technical Skills

Overall, these three data sources provided indications that from management's perspective, technical preparation is generally considered to be very good. Managers and supervisors participating in the RT focus group suggested that new graduates were generally well prepared technically and were familiar with current research in their field. However, while management was generally satisfied with this training, employees who responded to the survey frequently pointed out their less-than-adequate exposure to the latest technologies, both in respiratory care and in computer use. For instance, several survey respondents specifically mentioned that they were unfamiliar with the newer types of ventilators, and indicated that they were either not trained to use computers or did not receive the proper training to use the newer software applications.

Interpersonal and Communication Skills

While technical skills and training generally received high marks, at least from employers, other areas such as interpersonal and communication skills and management and organizational abilities were frequently mentioned by both employers and employees as those where additional preparation would have been useful. Among all of the skill areas, the most frequently mentioned skill deficiencies were in interpersonal and communications skills. Specifically, when asked what they were unprepared to do at the beginning of their jobs, the largest number of responding therapists said that they lacked interpersonal or management skills.

Educators participating in the study strongly agreed with employers about the importance of these skills. For example, in an interview one respiratory therapy educator said, "To me, a good therapist or student has good interpersonal relationships and has the ability to get along with their fellow students, other people working in the hospital, and to show patience and compassion for the patients. Without those skills, they shouldn't be in the field." These findings suggest that while therapy educators recognize that both technical and communication skills development should be educational objectives, students are not acquiring sufficient communication skills.

Management and Organization Skills

Several management and organization skills also appeared relatively frequently as areas of deficiencies, including time management, the knowledge of third-party payer rules, and the ability to monitor and chart patients' progress accurately. These nontechnical skills have also become more important in recent years, probably due to productivity enhancement efforts (which require therapists to assume a broader range of responsibilities) and the increasing complexity of hospital procedures and reimbursement requirements. Thus, having deficiencies in these areas may become especially troublesome because this may affect future productivity enhancement efforts.

Assessment and Evaluation Skills

The one technical area where supervisors and managers felt that new employees could offer better skills when beginning their jobs was in assessment and diagnostic skills. In the respiratory therapy focus group, participants strongly agreed that therapists need to have assessment and evaluation skills, but that most students applying for jobs are inadequate in this area. The survey results contained some specific examples of these highly important skills such as the ability to assess patients based on test results and exams and to read and interpret heart and respiratory monitors.

Physical Therapy: Acute Shortages, Past, Present, and Future

Recent Patterns of Supply and Demand and Future Projections

Although physical therapists and PTAs differ substantially in their job responsibilities, skills, and educational requirements, the labor market circumstances and availability of educational programs for these two occupations are very similar, especially in the San Francisco Bay Area. Consequently, the first part of this section treats the two occupations together. However, subsequent sections, covering the adequacy of skills to meet employment needs, present them separately.

National Trends. Among all the allied health occupations included in this study, physical therapy has experienced the most critical labor shortages, especially in hospital settings. For example, the supply of graduates from accredited physical therapy programs increased by forty-three percent from 1979-1980 to 1984-1985, but that supply was insufficient to meet demand (Institute of Medicine, 1989, p. 133). Afterwards the number of graduates increased only marginally, not as a result of insufficient student interest, but due to difficulties that programs have in financing expansion and placing students in clinical rotations. The recruitment problems that hospitals face nationwide serve to illustrate this situation. For instance, in a 1989 survey conducted by the American Hospital Association, fifty-seven percent of hospitals reported requiring more than ninety days to fill a full-time physical therapy position (Koska, 1989).

A significant shortage of PTAs has also existed. Major factors that have limited demand for PTAs have been Medicaid requirements, legal stipulations, and APTA guidelines that physical therapists conduct periodic patient evaluations and exercise regular supervision over PTAs, thereby restricting the use of assistants (Institute of Medicine, 1989, p. 129). Despite these limitations, demand remains high. Several participants in this study indicated that such demand for PTAs may be substantially underestimated because many hospitals have stopped recruiting these very scarce employees.

Generally future projections indicate that the supply/demand imbalance in physical therapy is likely to continue. The Bureau of Labor Statistics anticipates that job growth in physical therapy between 1986 and 2000 will be greater than that in any other allied health field (Institute of Medicine, 1989). Similar growth is projected for PTAs because many identical factors affect demand for both of these occupations. For example, shorter hospital stays, aging of the population, and growth in long-term care will increase demand for both physical therapists and assistants.

However, not all experts agree that future growth will match recent trends. In fact, some analyses suggest that growth in rehabilitation services will occur as the population ages, but a healthier population that will experience fewer strokes may offset that increase, particularly among women (Koska, 1989, p. 29).

Some influences have mainly affected the settings in which physical therapists work, and others have also produced greater aggregate demand, but their future impact is unknown. Specifically, physicians have increasingly referred patients for physical therapy because the patients wanted these services, and the public's interest in therapy for sports-related injuries has been "at an all time high" (Institute of Medicine, 1989, p. 130). It is unclear whether these trends will continue in the future.

Future supply is also uncertain, and over the short-to-medium period may even decline. If a master's degree becomes the standard for entry-level practice, fewer students may be motivated to enter the field unless there are commensurate increases in salaries to compensate for higher educational costs. Clinic-based participants in this study indicated that they did not pay a premium for entry-level employees with master's degrees, and under current cost restrictions, it is difficult to foresee such pay differentiation occurring in the future.

However, it is difficult to assess the impact of these increased education requirements. Current applicants to physical therapy programs far exceed places in college programs; therefore, "raising the bar" may not have a serious negative effect on the number of new graduates annually, even if some potential applicants are discouraged by the requirement of a graduate degree.

One indirect consequence of any future increase in the shortage of physical therapists could be heightened demand for PTAs. Several study participants, both therapists and assistants, indicated that if master's degrees are required for physical therapy entry, more severe shortages will increase reliance on PTAs and expand their job responsibilities.

Bay Area Trends. The experience of Bay Area health care providers parallels that of the nation concerning employment patterns for physical therapists and assistants. Participants in the physical therapy interviews and focus group almost uniformly agreed that it is very difficult to recruit physical therapists and PTAs. In particular, one focus group participant and several interview participants indicated that they have stopped trying to recruit PTAs because they are so difficult to find. More generally, the 1990 employment analysis by the California EDD (Bay Area Council, 1990, p. 37) also indicated that "employers report great difficulty finding experienced PTAs and qualified recent graduates."

The recruitment problem has been especially serious for hospitals because physical therapists are increasingly interested in positions outside of acute care settings. The movement of physical therapists into nonhospital settings is a major reason for the high turnover rates that California hospitals have been experiencing in recent years. These figures have averaged more than twenty percent annually (Logsdon & Beghin, 1988, p. 2).

Two focus group participants in this study indicated that this trend is beginning to affect PTAs, who are following physical therapists into private clinic practices. Even the one expert who indicated that the recruitment situation has improved in recent years still continues to conduct national and even international recruitment efforts to attract therapists.

Clearly, in the San Francisco Bay Area the future outlook for physical therapists and assistants is a positive one, with much growth expected. The California EDD (Bay Area Council, 1989, p. 37) bases its projection for PTAs on continuing expansion of physical therapy and rehabilitation services including sports medicine, which should also increase demand for physical therapists; the critical shortage of physical therapists; and employers' growing realization that PTAs are cost effective.

Physical Therapy Program Availability in the Bay Area

Currently, the availability of training programs in both physical therapy and physical therapy assisting is very limited in the Bay Area. Only one PTA program, at De Anza Community College, exists in the entire region. The only existing physical therapy program in Northern California, a program offered jointly by San Francisco State University and University of California at San Francisco, has become a master's program. However, in 1990 a new master's program opened at Samuel Merritt College in Oakland.

Results of this study indicate that the demand for both physical therapists and PTAs currently exceeds supply, and this imbalance is likely to continue in the future. A major contributing factor appears to be a lack of access to training opportunities, which is not likely to improve over the short-term.

The Match between Skill Requirements and Preparation

Physical Therapists

The interview, focus group, and survey data collected for this study highlighted several areas where entry-level physical therapists could benefit from improved skills development. The major deficiencies cited by managers of physical therapy units and physical therapists fell into three of the four major skill areas.

Treatment Skills. On the employer side, focus group participants and experts who were interviewed generally felt that newly hired physical therapists were technically well trained, but that they lacked clinical experience and the general "situational skills" that are learned from such experience.

Survey responses tended to confirm the need for clinical experience to develop some important skill areas. Specifically, in the survey responses the most frequently mentioned skill deficiency was in the area of mobilization techniques, which reflect the therapist's ability to use manual techniques to extend patients' range of motion or to improve the functioning of affected parts of the body. This skill requires the therapist to have a deep understanding of anatomy, physiology, neurology, and kinesiology. Beyond this basic knowledge, however, the therapist must also have had considerable clinical experience in manual manipulation because to acquire this skill, therapists must repeat it frequently.

However, respondents did not consider manual manipulation techniques to be *very important* for entry-level therapists. It is possible that supervisors recognize that entry-level therapists lack these skills and that they can only be developed through extensive on-the-job experience.

Administrative and Communication Skills. Management skills emerged as *very important* for physical therapists practicing in both acute care and private practice settings. These skills range from knowledge of third-party reimbursement rules to that of small business administration. In addition, because of labor market shortages, many physical therapists have had increased work loads and greater supervisory responsibilities for assistants and aides. Consequently, it is important to note that both employers and therapists mentioned these management and supervisory skills almost as frequently as they did mobilization techniques as areas where new therapists were somewhat deficient.

Another frequently mentioned deficiency was in the area of interpersonal skills, which included the ability to deal with assistants and aides, patients, physicians, or third-party payers. This deficiency is especially important because much of the success of physical therapy depends on the therapist's ability to motivate a patient to do something that may be painful or unpleasant. Consequently, the inability to relate well to patients can seriously impede their rehabilitation.

Assessment and Diagnosis. The third most frequently mentioned skill deficiency was in assessment and diagnosis, and both physical therapists and managers mentioned this skill as a critical need. Some examples of skills in this area include the ability to take a patient's history and to make a diagnosis based on their history and symptoms. Employers frequently said that the typical entry-level therapist is strong in paper skills, but weak in skills where decisions must often be made quickly and independently.

Physical Therapist Assistants

Over the past ten years the duties and responsibilities of PTAs have probably changed as much as or more than those of therapists. In light of these changes and the projected future demand for PTAs, it is important to identify the extent to which entry-level skills have matched employment requirements. To answer this question, this study provided data from managers of physical therapy units, from physical therapists who directly supervise PTAs in hospitals and in other settings, and from PTAs themselves.

Overall, very few skill areas were identified as deficiencies among beginning PTAs, and some focus group participants strongly asserted that newly hired PTAs were well qualified. However, some deficiencies were mentioned, which were distributed across all four skill areas: Administrative and Communication Skills, Treatment, Assessment and Diagnosis, and Basic Knowledge. The particular areas that were identified as needing improvement were interpersonal skills, writing skills, knowledge of physiology, manipulation skills, and neurological skills.

Administration and Communication Skills. The most frequently mentioned area requiring improvement involved interpersonal relations and communication skills, which was not a surprising finding given the expanded duties of assistants over the past decade. In addition to performing a wider range of treatments than ever before, assistants became more involved in administrative activities requiring communication with other health care providers and other hospital personnel. Skills that emerged as having gained in significance, which were discussed earlier—the ability to communicate with physicians, therapists, and patients and to assist in training new assistants, and so on—illustrated this point.

Writing skills were also frequently cited as an area where assistants needed more preparation, a requirement that is linked to the growing autonomy of the PTA position. For example, over recent years assistants have been given more responsibility for charting patients' progress and for communicating with other health professionals in writing.

General Knowledge and Treatment Skills. One basic knowledge area, physiology, and two treatment skills, manipulation and neurological, were also identified as areas where PTAs could be better prepared. While assistants cited physiology and manipulation as areas where they lacked skills development, employers cited neurological skills as an area of deficiency. In addition, research findings indicated that both physiology and neurology were areas that have gained in significance. Finally, in responses to open-ended questions, manipulation skills were often cited as an area of deficiency for PTAs, although this observation was based on a limited number of completed questionnaires.

Summary and Conclusions

This chapter presented analyses of the changing skill requirements in three medical therapy occupations; summarized projections of demand for trained personnel in these occupations; assessed the extent to which Bay Area educational institutions will be able to meet future personnel requirements; and identified areas where employers or health care professionals felt that entry-level job skills could be stronger. Based on these analyses, this concluding section links findings from the study to education policies and offers recommendations for curriculum review and program planning.

Meeting Skills Requirements

Technical Skills

Results of this study led to the conclusion that with very few exceptions, available training in the Bay Area for respiratory therapists, physical therapists, and PTAs has effectively met the technical skill requirements of local health care facilities. However, responses from both health care employers and therapy professionals themselves highlighted the following limited deficiencies in entry-level technical skills:

- Insufficient knowledge of computers and lack of familiarity with some of the most up-to-date equipment in respiratory care.

- Less-than-adequate skill in the area of mobilization techniques among physical therapists, possibly reflecting their lack of clinical experience.

- Deficiencies in knowledge of physiology and in manipulation and neurological skills among PTAs; the latter was possibly due to the recentness with which PTAs have been involved in these treatment areas.

In the past five years all three occupations studied here have experienced important changes in job duties and required skills. Especially in respiratory therapy, many of these changes have been a result of advances in technology. Consequently, our findings suggest that respiratory therapy programs may need to identify new opportunities for students to receive exposure to technological advances.

Nontechnical Skills

Study findings on the adequacy of entry-level employees' nontechnical skills were relatively consistent across the three therapy occupations. Entry-level employees in all of the therapy occupations showed a need for additional knowledge of health care cost containment and reimbursement rules, and for better written and verbal communication skills. Experts participating in the study indicated that improved communication skills would positively influence many important activities of respiratory and physical therapists and PTAs, including documenting patient treatment, providing instruction to patients, and communicating with other health professionals in environments where care increasingly involves team efforts.

In physical therapy only, results of this research indicated that students needed greater exposure to management training and the fundamentals of small business management. This appeared to be important not only for physical therapists who operate their own clinics, but also to those who supervised other therapists and PTAs in various types of facilities and who work as employees in clinic settings.

These findings suggest that administrators of educational programs and instructors for all three therapy occupations should review their curricula to ensure that they include a solid foundation of information on health care economics and hospital and clinic management. For physical therapists these curricula should also include management courses. Educational program planners should also ensure that required courses and course assignments develop the high-level, critical thinking skills that facilitate adaptation to changing job requirements, and the written and verbal communication skills that are necessary for working productively in highly technical occupations.

Meeting Personnel Requirements

In all three of the therapy occupations studied here—physical therapy, respiratory therapy, and PTA—current labor market needs are not being satisfied, and they likely will not be met in the future without increased numbers of graduates in the Bay Area. There are insufficient numbers of programs for physical therapy and PTA, and none of these programs is offered on a part-time basis. While there are larger numbers of respiratory therapy programs, they are often inaccessible to older, returning students who need to work while attending school at night. In addition, students in the East Bay, especially minority students, appear to have limited access to a local, part-time program that might increase their very small and declining representations in the field. These findings on program structure and availability lead to several recommendations with respect to program planning.

First, area community colleges and health care providers should join together to undertake a region-wide needs assessment for one or more additional PTA programs. That effort should be directed at identifying the extent of unmet needs for PTAs, where those deficiencies exist, the most accessible geographic locations for new programs, and the feasibility of part-time programs, especially ones where students might work in other hospital jobs while attending school.

Second, in view of substantial personnel shortages, efforts should be made to identify the potential for articulated programs between PTAs and physical therapists. This evaluation should include a region-wide assessment of interest in further education by currently employed PTAs and PTA students. However, questions about student interest in additional education should be framed carefully because programs explicitly discourage students from viewing a PTA program as a stepping-stone to a physical therapy degree.

Baccalaureate nursing programs in California have successfully implemented articulation agreements with associate degree nursing programs, and those efforts have increased the supply of B.S. trained nurses, while also supporting individuals' career advancement goals. Those programs could be used as models for articulation between the two physical therapy occupations. While it is likely that many students who receive associate degrees in physical therapy assisting will not be interested in pursuing the master's degree that will soon be a requirement for physical therapy practice, even small numbers of new therapists will help to alleviate current and projected shortages.

Furthermore, articulated programs might alter the profile of PTA students by attracting some individuals who see a secure assistant position as a good source of financial support while attending school to advance into a physical therapist job. These articulated programs would be especially critical for attracting students from California's burgeoning minority and immigrant populations to the physical therapy field, where they are not well represented.[13]

MEDICAL RECORD OCCUPATIONS

Introduction

This section presents findings on the changing skill requirements in three medical record occupations, based both on analyses of primary data collected explicitly for this study and on recently published research conducted by other health industry analysts. The primary data included eighteen hour-long structured interviews with experts in the medical record field, a two-hour focus group meeting, and survey responses gathered from fifty-five people working in hospitals and HMOs in the San Francisco Bay Area. A complete description of this research methodology is detailed in the third section of this report.

The beginning of this section provides an overview of the medical record occupations, including a description of the major changes occurring in the field and their effects on job responsibilities and work environments. This overview also covers education and certification requirements. The second unit of this section addresses in detail the skills required both for entry into medical record occupations and for advancement, and explains how these skill requirements have changed over recent years. The final section focuses on the extent to which Bay Area educational programs have met industry labor force requirements and provides several recommendations for addressing current shortages in qualified personnel.

Occupational Overview

The medical record profession is concerned primarily with the management of patient records. While this task entails the storage and safekeeping of the physical record itself, the profession's broader purpose is to manage the information contained within that record. Patient records include medical histories, the results of physical examinations, reports of x-ray and laboratory tests, diagnosis and treatment plans, and physicians' orders and notes, among other sources of information. Although the record is primarily used for the medical care of the patient, the information is also used for legal, financial, research, and other purposes. For instance, insurance companies use patient record information to verify insurance claims; hospital administrators to evaluate the cost effectiveness of particular treatments or procedures; and health agencies to investigate disease patterns and trends.

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[13] Researchers on this project met with so many master's level nurses who began their careers with associate degrees, that they concluded a similar careeer path also should be facilitated for the physical therapy field, especially in view of current and projected severe personnel shortages.

Although hospitals are the largest employer of medical record personnel, medical record expertise is also needed in many other settings. Nonhospital health care providers such as HMOs, nursing homes or long-term care facilities, outpatient care centers, home health agencies, and physicians' offices need personnel to maintain records and to expedite reimbursement. In addition, organizations not involved in direct care such as insurance companies and public health agencies employ medical record specialists to help set policy, analyze data, and evaluate provider performance. Furthermore, other employers such as contract agencies and consulting firms supply medical record personnel to these institutions and organizations, usually on a temporary or intermittent basis. While all of these employers can provide additional information about the medical record profession, this report focuses primarily on information from health care institutions.

The medical record occupations include transcriptionist, clerk, technician, and administrator, and each work in some aspect of record management. Transcriptionists use dictating machines or other equipment to type medical reports that are included in the record. Clerks file the record after a patient is discharged, pull it for a patient visit or health care provider inquiry, and file documentation into the record. Technicians code the medical information contained in the record, organize the coded information for reimbursement purposes, abstract other data to meet administrative and governmental requirements, and answer medical and legal inquiries. In turn, administrators oversee the operations of the department, determine staffing and budget requirements, set policies for technical procedures, develop systems for information storage and retrieval, and work with hospital administrators on cost and care evaluations.

From these occupations we selected three to be included in the study: medical record administrator, technician, and clerk. Although it would have been appropriate to include transcriptionists, they were not chosen for several reasons. First, although the transcriptionist occupation represented a possible step in the medical record career path, it was somewhat removed from the other occupations. That is, even though some clerks and technicians become transcriptionists, and some transcriptionists become technicians or move into other allied health fields, the more common career ladder involves a progression from clerk to technician and technician to administrator. Second, as stated earlier in this report, a major concern was to limit the number of occupations studied in each occupational group to ensure the intensive data collection required for job analysis. For these reasons, we chose not to include transcriptionists in this study.

The Forces of Change

Like the other allied health occupations included in this study, the medical record field has undergone significant change in recent years. Several forces have combined to bring about this change, including stricter reimbursement requirements, an expanded regulatory scope, new technologies, greater demand for information, and a cost containment mandate.

Stricter Reimbursement Requirements

As mentioned earlier, the 1983 Medicare reform package replaced fee-for-service reimbursement with a system of fixed payments based on Diagnosis-Related Groups (DRGs). These groups took into account the patient's diagnosis, the procedures conducted, and any complicating conditions. Depending upon the DRG associated with the patient's hospital stay, the federal government paid a set amount to the health care provider. More specifically, the legislation required that medical record departments code a specified number of diagnoses and procedures for each Medicare patient using the International Classification of Diseases-9th Revision (ICD-9) coding system, and then assign one of more than four-hundred DRGs to each set of codes. The main effect of the advent of DRGs was to shift the emphasis from coding patient records solely for clinical purposes to coding for reimbursement purposes as well.

Expanded Regulatory Scope

Although the initial fixed payment legislation applied only to inpatient stays in acute care hospitals for Medicare clients, regulations soon expanded to cover other types of health care, settings, and insurers. In addition to coding inpatient stays, Medicare soon required coding of ambulatory surgery using the Current Procedural Terminology-4th

Edition (CPT-4) coding system. Along with acute care hospitals, Medicare also required ICD-9 coding in long-term care facilities and physician offices. Finally, other public and private health insurers began to require coding and systems similar to DRGs. For example, MediCal, California's version of Medicaid for low-income families with children, required ICD-9 coding for diagnoses, and Champus, an insurer for military families, required the reporting of DRGs.

Since 1983, the impact of changing reimbursement regulations permeated the medical record industry. Although not all insurers converted to a coding and DRG system, instead preferring to rely on a flat daily rate, cost per case, or other payment method, many were influenced by federal government policies. As one hospital medical record director stated, "We never used to submit codes to any of the payers. Now, most of them use codes." Moreover, the functioning of medical record departments began to be driven by DRG systems. Even though Medicare represented less than one-third of some hospitals' accounts receivable, many medical record departments implemented a policy of coding and assigning DRGs to all records, regardless of the requirements of the patient's insurer.

Most of the professionals interviewed for this study indicated that they expect the trend toward more coding and reimbursement based on diagnosis to continue. As one HMO administrator said, "We will never do less coding." Recent California legislation required the reporting of external cause of injury codes (E-codes), and a pending bill would require indicators of the severity of an illness. Furthermore, many medical record professionals expect that Medicare will eventually implement a system that is similar to DRGs for all types of outpatient care and settings. These Ambulatory Patient Groups (APGs) or Ambulatory Visit Groups (AVGs) could be expected to have the same revolutionary impact on outpatient reimbursement as DRGs have had on inpatient care (CMRA, 1987, p. 1). Finally, in addition to affecting reimbursement, state and federal legislation continues to grow in the areas of licensing of facilities, accrediting of health care organizations, and confidentiality of medical information.

New Technologies

Many of the medical record administrators interviewed for this study indicated that next to the advent of DRGs, the greatest change occurring in medical record departments in recent years has been the introduction of new technologies. For example, one director described the rapid rise of computer technology: "We now have fourteen terminals. There were none eight years ago when I started working here. . . . We are getting close to everyone in the department having a terminal on their desk." While many medical record departments did have some sort of computer technology before 1983, the widespread use of automation has occurred only in recent years. By 1990, medical record departments were using computer systems to help enter orders for charts, maintain patient indices, track records, analyze documentation deficiencies, code medical information and assign DRGs, abstract data, and retrieve information. Departments also installed software developed especially for medical record management, including "encoders" and DRG "groupers." In addition to these technologies, microfilm, microfiche, and magnetic tape drastically reduced the space needed to store older records.

One of the most recent technological developments to affect medical record departments has been the integrated computer system. This system linked the computer functions of several departments such as admissions, billing, and medical records, generated a single database, and permitted the cross-checking of data. Although this system computerized most patient record information, other sources of information such as laboratory reports and physicians' notes were still recorded on paper. The next major wave of technology that many health care professionals anticipate is the fully automated record. With terminals on every hospital floor and the hospital system linked to doctors' offices, all medical information will be recorded directly into a single computer system, and no paperwork will be required. In addition to changes in data management systems, the advent of optical disk storage will reduce even further the space required for storing records. Although there is some debate about what these technologies will ultimately look like, most interviewees agreed that medical record management is heading toward even greater automation.

Greater Demand for Information

Many professionals interviewed for this study agreed that the field of medical records has recently entered the information age. Although physicians, insurance companies, and hospital administrators, among others, had already regarded the patient record as a source of clinical, legal, and financial information, more people began to see it as containing a wealth of untapped information. As one administrator and educator stated, "For years we put information into records, then suddenly, it seemed that everyone realized what was there and that you could take the information out again." Moreover, state and federal agencies, insurance companies, business offices, law firms, research organizations, and medical staff recognized the potential for evaluating health care patterns, and requests for information eventually filtered through the medical record departments. Responding to this trend, professionals in the field began to call themselves health information specialists, and some educational programs changed their names from Medical Record Administration, Management or Technology to Health Information Administration, Management or Technology. In fact, the California Medical Record Association recently received endorsement from the national association to change its name to the California Health Information Association.

Cost Containment Mandate

Concern about containing health care costs has affected many of the trends occurring in the medical record field. Accompanying the changes described above, this concern reinforced the need for speed and accuracy. Specifically, hospitals made it a priority to shorten the turnaround time for billing and placed greater emphasis on quality assurance. In the first case, while invoicing used to take several weeks or longer, most hospitals have reduced their turnaround time to only days after the patient's discharge. To cut this time even further, many hospitals have made future plans to switch completely to concurrent coding; that is, coding of the record while the patient is still in the hospital. In the second case, after 1983 hospitals depended on the accuracy of DRG assignment to ensure reimbursement. Any errors could cause a claim to be rejected by an insurer. Thus, the importance of quality assurance in coding and DRGs has increased greatly.

The Impact of Change

While the trends occurring in health care have not yet transformed the medical record field into the paperless world of the future, they have certainly brought about important changes. Above all, because of its role in reimbursement, the medical record field has gained in stature in most health care settings. In addition, stricter reimbursement requirements, an expanded regulatory scope, new technologies, greater demand for information, and a cost containment mandate have caused important shifts in job responsibilities and in the settings in which people work.

Changing Job Responsibilities

Medical Record Administrator. Data collected for this study indicated that, as a result of the changing status of the profession, medical record administrators have assumed a more prominent position as members of the hospital management team. For instance, administrators worked closely with hospital management on cost and care evaluations, particularly in quality assurance and utilization review and management. However, the increasing status of medical records also raised the question of departmental jurisdiction over the handling of information. In some cases, medical record administrators took on data processing and quality assurance tasks, while sometimes other department managers assumed these responsibilities. In some hospitals, medical record administrators even vied for chief information officer positions, overseeing functions in management information systems and data processing as well as in medical records.

Within the medical record department, administrators have always performed a broad range of duties including staffing, budgeting, setting policies for technical procedures, and developing information storage and retrieval systems. However, because of the changes occurring in health care, administrators began to devote more attention to financial management, to setting policies in the areas of coding, DRG assignment, and information release, and to developing computer information systems. Since technical and technological adjustments were constantly being made, administrators also spent more time keeping abreast of changes in the field and providing opportunities for staff development. Finally, administrators continuously sought ways to streamline and speed up the functioning of the department, while at the same time maintaining quality.

Medical Record Technician. Before 1983, technicians performed a broad array of medical record duties including documentation analysis, coding, abstracting, and handling requests for information. However, with the advent of DRGs, coding became much more important as an area of expertise. For the first time, employers used the term Medical Record Coder, instead of Medical Record Technician, when advertising positions. The importance of analysis, abstracting, and handling requests for information changed less dramatically than did coding, although technicians faced additional documentation, statistical, and confidentiality requirements. Along with these more traditional duties, some technicians assumed data processing and report writing responsibilities to handle the growing number of research requests and performed quality assurance procedures. While technicians were previously somewhat isolated in medical record departments, the increased importance of searching for documentation, of handling requests for information, and of working with other departments brought technicians into more frequent contact with people outside of medical records, in particular with physicians and other allied health staff.

Medical Record Clerk. Traditionally, clerks were responsible for filing, pulling, and tracking records, as well as for handling correspondence. In some hospitals, as clerks were promoted, they also performed technical duties such as documentation analysis and some coding. The trends occurring in health care have changed not only how clerks performed their jobs, but they have also altered to some extent what tasks clerks performed. For instance, clerks performed their duties more frequently with the use of computer technology. Furthermore, as clerks advanced, they assumed more technical responsibilities. In some hospitals, clerks became responsible for some tasks that technicians previously performed such as documentation analysis. Finally, like technicians, clerks also had more frequent contact with people outside the department, especially with medical staff.

Changing Work Environments

Although most medical record personnel work in hospitals, the number working in nonhospital settings has been growing over the years. Although part of this growth is in response to the general shift toward alternative health care settings, further impetus comes from changing reimbursement requirements in nonacute care institutions. Despite this growth, most nonhospital providers still employ general clerical or administrative staff or other allied health personnel such as licensed vocational nurses or medical assistants to manage their medical records since medical record job responsibilities in these settings primarily consist of checking for appropriate documentation, maintaining a filing system, and using a simplified coding system for reimbursement. In some cases, nonhospital providers find they have more flexibility in staffing when they hire employees with a nursing background rather than those with traditional medical record training.

Medical Record Administrator. While most medical record administrators work in hospitals, generally in director, assistant director, or supervisor positions, a growing number are employed by HMOs, public health agencies, research organizations, software development firms, educational institutions, and other health information related institutions. In addition, consulting firms hire administrators to provide expertise to health care organizations such as long-term care facilities, which may not employ certified medical record personnel. Consultants work with the clerical or allied health personnel who handle medical records to keep them up-to-date on changing reimbursement requirements and other regulations, or simply to help make procedures more efficient.

Medical Record Technician. Although most medical record technicians work in hospitals, a growing number are sought by other health care institutions. As Table 6 shows, from 1987 to 1995 the proportion of technicians employed in hospitals is expected to drop slightly from about fifty-three to fifty-one percent of total employment. At the same time, the fastest growth is expected to occur in outpatient care, with employment in these settings anticipated to increase more than fifty percent during this eight-year period. Because of their training in coding and confidentiality procedures, technicians are needed to handle changing reimbursement, documentation, and information release requirements. In some cases, health care providers replace general clerical or other allied health personnel with trained technicians.

In addition to finding employment in health care institutions, technicians work for consulting firms and contract agencies. Like administrators, technicians may work in a consultative capacity with clerical or allied health personnel who handle medical records in some health care organizations to keep them up-to-date on changing regulations or to increase office efficiency. Technicians with experience in hospitals or other settings can work more independently and receive higher wages when they work for a medical record consulting firm. In addition, through contract agencies, technicians provide temporary assistance to hospitals and other facilities, particularly in the area of coding. Medical record technicians who have significant experience in coding inpatient records can often obtain more flexible hours and higher hourly wages through contract employment.

Medical Record Clerk. As with technicians, the need for medical clerical expertise is also moving outside the hospital. Previously, in many nonhospital settings, especially physician offices, general clerical or administrative people were assigned to handle medical records. However, with the increasing importance of coding for reimbursement, more of these providers are seeking clerical personnel who have had some training in medical records. Where health care providers do not need or desire the full expertise of a technician, they may seek clerks who have experience in coding.

Education and Certification Requirements

In contrast to some of the other allied health fields included in this study, a fair amount of flexibility exists in the education and certification required of personnel working in the medical record field. Depending on the hospital, directors of medical record departments may have completed a two-year medical record program, a four-year program,

Table 6
MRT Occupational Projection for the Six-County Bay Area, 1987-1995

	1987	%	1995	%	Absolute	Change	% Change
Total Employment	1070	100.0	1400	100.0	330	100.0	30.8
Hospitals	570	53.3	720	51.4	150	45.5	26.3
Nursing Facilities	130	12.1	150	10.7	20	6.1	15.4
Outpatient Care	230	21.5	360	25.7	130	39.4	56.5
Other	140	13.1	170	12.1	30	9.1	21.4

Source: Bay Area Council, 1990, pp. 42-61 or may even possess a master's degree in another field. Personnel who perform technical duties exhibit a similar range of experience: They may have advanced from an uncertified clerical position, or may have completed a two-year or even a four-year medical record program. While work experience has in some cases been as important as education or certification, the importance of holding the appropriate credential appears to be growing.

Medical Record Administrator

Strictly speaking, the only people allowed to use the medical record administrator title are people who hold Registered Record Administrator (RRA) certification. In order to become certified, students must complete a medical record administrator program accredited by the American Medical Record Association (AMRA) in conjunction with the American Medical Association, and they must pass the AMRA certification exam. Medical record administrator programs last four years and lead to a baccalaureate degree, although students who already hold a bachelor's degree in another field may complete a one-year certificate program in medical record administration in order to be eligible to write the certification exam.

While medical record administrators must possess an RRA to use the title, directors of medical record departments and other supervisory staff do not necessarily have RRA certification. On the one hand, the medical record directors of some hospitals and HMOs may only be trained as technicians, even though they perform the full range of administrator duties. On the other hand, at some larger hospitals, medical record administrators may hold a master's degree in business, public health, or library science and may or may not have a bachelor's degree in medical records. However, while some flexibility in staffing is possible, health care organizations are required by the Joint Commission on the Accreditation of Healthcare Organizations to employ certified medical record personnel at least in a consultative capacity. When faced with the choice of hiring a person with a strong management background versus a candidate with a medical record background and some management experience, most of the medical record professionals interviewed for this study preferred to hire the person with the medical record training. In fact, they believed that having no medical record experience put administrators at a distinct disadvantage.

A recent development in the education options open to medical record professionals has been the emergence of a master's degree in health information science. Aimed primarily at medical record administrators, these programs provide an additional layer of expertise for professionals entering, continuing in, or moving out of the medical record field.

Medical Record Technician

Once again, the only people allowed to use the medical record technician title are those who hold the Accredited Record Technician (ART) credential. ART status can be earned in two ways. The first involves completion of a medical record technician program accredited by AMRA in conjunction with the American Medical Association. Medical record technician programs last two years and lead to an associate's degree. The second route requires completion of the AMRA Independent Study Program in Medical Record Technology *plus* earning an additional thirty semester credits of approved college work. After completing either of these requirements, candidates are eligible to write the certification exam.

While medical record technicians must possess an ART to use the title, personnel who hold technical positions in medical record departments do not necessarily have the ART credential. Historically, turnover in medical record departments is very low, and hiring is often done from within the department. Clerks who show sufficient interest and aptitude may learn coding or take on greater responsibility for handling requests for information. Over time, they may be promoted to technical positions. Furthermore, many administrators interviewed for this study valued experience over education, particularly when hiring from the outside. In the case of coding, directors stated that they would only hire someone with two years of demonstrated coding experience, whether or not they possessed an ART. However, in other cases, holding the appropriate credential appears to be very important. For instance, some hospitals require additional coursework before promoting employees, or place clerks on trainee status until they acquire their credential.

Several changes have occurred since the 1970s in educational programs for medical record technicians. First, AMRA's Independent Study Program (ISP) replaced its earlier correspondence course. One of the main differences between the ISP and the correspondence course was the additional requirement that students complete college coursework before being eligible to take the written certification exam. Members of the profession believed that a broader education was desirable for technicians. Second, a number of colleges and universities developed articulation programs that allow ARTs to work toward a baccalaureate degree in medical record administration and to earn the RRA credential. ARTs earned credit for both the general education and the specific medical record courses they had taken and were able to complete the baccalaureate degree in an accelerated amount of time. Professionals in the field recognized the technician degree as a foundation for a degree in medical record administration.

Medical Record Clerk

No certification process exists for medical record clerks; however, some courses and short-term educational programs are available. Generally, medical record clerk positions provide entry-level job opportunities. Especially in hospitals, clerk positions may represent an employee's first real job. Usually, employers' only requirements are that a job applicant have a high school diploma or its equivalent and be able to type thirty-five to forty words per minute. However, hospitals often require some coursework for advancement, even within the clerical track. In other settings, such as physician offices, entry-level clerks may be required to have completed some relevant coursework either during or after high school—such as medical terminology—or to have had previous work experience in another health care facility.

In recent years, several educational opportunities have become available in California for medical record clerks. Interested students can now take courses at a number of high schools and community colleges. At the high school level, for instance, some Regional Occupation Programs and Centers offer medical clerical programs with concentrations in medical records and insurance billing. In addition, some community colleges offer short-term clerical programs, which last for one or two semesters, depending upon the level of the program. Moreover, a number of community colleges also offer coding programs for students with some background or concurrent employment in medical records. Often, these clerical and coding courses overlap with and can be applied to medical record technician programs.

Changing Skill Requirements

Introduction

Results of this study demonstrate that changes in the medical record field have had a significant impact on the skills required in administrator, technician, and clerk occupations. Changing reimbursement requirements, an expanded regulatory scope, new technologies, greater demand for information, and a cost containment mandate have increased the need for specialized skills, and they have highlighted the importance of a strong foundation in basic skills and general medical record science.

Although many skills have gained in importance over recent years, those in technology and technical areas stand out as being in the forefront of change. Above all, new technologies have altered the way people perform their jobs. As a result, computer knowledge has become much more important. In particular, the ability to use an integrated computer system is crucial for administrators, technicians, and clerks alike. In addition to new technologies, changing reimbursement requirements and an expanded regulatory scope have increased the significance of technical skills. Specifically, the ability to perform coding and DRG assignments have become much more crucial. Whereas administrators need a more general knowledge of codes and DRGs in order to set department policies, technicians and clerks require a more practical knowledge of these skills to perform their jobs.

While the changes in the medical record field have brought with them the need for more specialized knowledge, particularly in technology and technical areas, they have also created a need for a strong foundation in basic skills and general medical record science. For instance, the importance of tracking down documentation deficiencies, of verifying diagnoses and procedures, and of handling requests for information have all increased the importance of contact with people outside of the medical record department. As a result, medical record personnel must be able to communicate verbally and in writing, and must have the interpersonal skills necessary to work with other people. Moreover, personnel must also have a firm knowledge of confidentiality laws and policies. Although the specific skills required for entry-level performance and job advancement differ for administrators, technicians, and clerks, the need for a strong foundation in basic and medical record skills exists in all three occupations.

Changing reimbursement requirements have increased the importance of coding and DRG assignment, and they have also increased the importance of the skills underlying these procedures. In particular, the ability to recognize and seek out diagnoses, procedures, and complicating conditions requires a strong background in sciences, including medical terminology, anatomy and physiology, disease processes, microbiology, and clinical procedures. Furthermore, since coding and DRG assignment are performed for both clinical and reimbursement purposes, medical record personnel need a solid background in professional ethics to guide the choices they make. Finally, the ability to abstract data and respond to requests for information requires competency in basic math.

The next unit presents findings from the hospital survey on skill requirements in medical record administrator, technician, and clerk occupations. The survey represented the culmination of several information-gathering activities, including in-depth interviews and a focus group meeting with a variety of experts from a range of health care settings. These experts included educators, administrators, supervisors, coders and other technicians, clerks, and consultants. In addition, we spoke with professionals in diverse settings such as large private hospitals, small county hospitals, and long-term care facilities. From these conversations we developed separate but overlapping skills questionnaires for each of the three medical record occupations. The survey was then sent to fifteen Bay Area hospitals, and seventeen administrators, nineteen technicians, and nineteen clerks responded.

For the purpose of the survey, medical record skills were grouped into several broad categories. Four categories were common to each of the administrator, technician, and clerk questionnaires: Technical Procedures, the Role of Technology, Requests for Information, and Supervising. In addition to the core categories, the administrator questionnaire surveyed General Management and Managing Hospital Relationships skills, and the clerk questionnaire surveyed Clerical Procedures. For each skill, knowledge, or ability, survey respondents indicated on a five-point scale how important the skill was for entry-level performance, how important it was for advancement, and how the skill had changed in importance over the past five years. Appendix C contains the complete survey results.

The skills, knowledge, and abilities are defined as follows:

- *Technical Procedures:* Skills, knowledge, and abilities related to documentation analysis, coding, DRG assignment, and abstracting. These include specialized skills such as knowledge of ICD-9 codes and more general skills such as knowledge of different sciences.

- *The Role of Technology:* Skills, knowledge, and abilities related to the use of technology. These include specialized skills such as the use of specific medical record software (e.g., the DRG grouper) and more general skills such as the ability to use a computer keyboard.

- *Requests for Information:* Skills, knowledge, and abilities related to handling requests for information. These include the ability to work with different requesters such as physicians or lawyers, knowledge of confidentiality laws, and basic communication and math skills.

- *Supervising*[14]: Skills, knowledge, and abilities related to working with people within the medical record department. These pertain to supervising others and to working as a member of a team, and they include such SKAs as the abilities to set policy and to work with a multicultural staff.

- *General Management:* Skills, knowledge, and abilities related to the general management skills needed by medical record administrators, including budgeting, handling contracts, work flow efficiency, and providing leadership.

- *Managing Hospital Relationships:* Skills, knowledge, and abilities needed by administrators to work with other hospital departments, hospital administration, and medical staff.

- *Clerical Procedures*: Skills, knowledge, and abilities needed by clerks to perform such duties as filing, tracking, and assembling records, as well as filing documentation into records.

For both entry-level and advancement, skills were grouped into four levels: (1) *very important*, (2) *moderately important*, (3) *somewhat important*, and (4) *not important*. With respect to change, skills were grouped into *much more important*, *more important*, *somewhat more important*, and *not more important* skills. The top levels, *very important* and *much more important*, represented eighty to one-hundred percent agreement among respondents that the skill was either important or had gained in importance. The next tier represented fifty to seventy-nine percent agreement, the third tier twenty to forty-nine percent, and the bottom tier zero to nineteen percent agreement. The following sections provide a discussion of the patterns of skills that emerged from these survey summaries.

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[14] In the case of the "Supervising" category, the title was changed to "Managing People" in the administrator survey and to "Organization of Work" in the clerk survey.

Findings from the fixed-response questionnaires are supplemented with results from our in-depth interviews, focus group meeting, and open-ended survey responses.

Skill Requirements for Medical Record Administrators

Medical record administrators oversee the functioning of the medical record department, which includes staffing, budgeting, setting policies for technical procedures and information release, and developing information storage and retrieval systems. However, recent changes in the field have shifted responsibilities somewhat. Currently, administrators work more closely with hospital administration and other hospital departments, especially on cost and care evaluations. Moreover, within the department they devote more attention to cost management, to setting policies in the areas of coding, DRG assignment, and information release, to developing computer information systems, and to speeding up department procedures, while at the same time assuring quality.

Not surprisingly, changing skill requirements have paralleled shifting job responsibilities for medical record administrators. Our survey results indicated that in recent years skills in technology, general management, and technical areas gained more than other skills in importance. Specifically, administrators needed a knowledge of both the general capabilities and specific uses of computer systems and a knowledge of financial management procedures. They were also required to have both the ability to develop policies for unclear areas in coding and DRG reimbursement and to manage work flow efficiency. However, in the role of manager, medical record administrators needed less specialized technical and information skills such as knowledge of specific coding systems, more advanced sciences, or epidemiology. Instead, administrators were required to have a more general knowledge in these areas.

The Skills Needed for Entry Level

Administrators categorized the overwhelming majority of skills as *very important* for entry-level performance. These skills involved every area of job performance, including General Management and Managing People, Technology, Technical Procedures, Requests for Information, and Hospital Relationships. Specifically, administrators emphasized such varied skills as financial management, managing a multicultural staff, developing an integrated computer system, developing policies for coding and DRG assignment, developing policies for information release, and communicating with various hospital departments. In addition to this broad overall background, administrators also needed a broad background within each skill area. For instance, in the area of Technology, administrators reported that they needed a range of skills—from knowledge of the general capabilities of computer information systems, to knowledge of specific medical record software, to skill in using word processing and spread sheet programs.

Administrators relegated only a very small number of skills for entry-level to a less important status. Most of these fell into the Technical and Information categories. Generally, administrators indicated that highly specialized or technical skills were less important than a more general knowledge in the same area. For instance, while administrators considered a background in medical terminology and disease processes to be very important for entry level, they placed less emphasis on more advanced sciences such as microbiology. Similarly, administrators reported that the ability to develop policies for unclear areas in coding was more important than knowledge of specific codes.

The Skills Needed for Advancement

Medical record administrators begin working as supervisors, assistant directors, or even directors, and they generally move up within this hierarchy. As a further career move, some advance into hospital administration, while others move out of the hospital into consulting firms, public health agencies, or research organizations. As a result, administrators are generally required to have a broad range of management skills for advancement, although a background in financial management and computer information systems is also particularly important. In some cases, both the ability to analyze statistics and to write research reports are indispensable for continuing to work with health data.

The skills needed for advancement in administrator jobs differed very little from those required for entry level. Once again, administrators indicated that they needed an overall background, involving all areas of job performance, and a broad background within each skill area. Only a handful of skills moved from *moderately important* to *very important* levels when progressing from entry-level to advancement. The skills that gained in importance included knowledge of accounting, computer programming, and statistical analysis. Generally, the only skills that were not required for advancement pertained to the actual practice of coding patient records.

The Skills That Have Recently Gained in Importance

The changes in the medical record field that appeared to have the greatest impact on skill requirements in administrator jobs were the introduction of new technologies, changing reimbursement requirements, and general cost concerns. Administrators identified Technology, Technical, and General Management skills as having gained the most in importance over recent years. These skills included knowledge of the general capabilities and specific uses of computer information systems, the ability to develop policies for coding and DRG optimization, knowledge of financial management principles, and the ability to manage change. Along with these *much more important* skills, administrators identified a second tier of *more important* skills. These covered all skill categories and encompassed such varied skills as assessing the quality of the department's services, providing ongoing training for staff to keep up with changes in the field, developing policies for additional technical procedures, being able to communicate in writing and to prepare research reports, and having the ability to communicate with other hospital departments.

Although changes in the medical record field have increased the importance of all skill categories for administrator jobs, Technology skills gained the most. Administrators reported all Technology skills in the top two categories of change, with the majority of skills emerging as *much more important.* The skills that gained the least in importance tended to be clustered in the Technical and Information categories. Once again, administrators de-emphasized the skills needed for actual coding. In addition, administrators indicated that the importance of handling basic requests for information remained relatively constant in recent years.

Important Entry-Level Skills That Have Recently Gained in Significance

Most of the skills required for entry-level performance in administrator jobs have also recently gained in importance. However, several skill categories stood out among them. Administrators indicated that certain Technology, Technical, and General Management skills ranked highest among entry-level skills and have gained the most in recent years. These included a general knowledge of the use of computer information systems, the ability to develop policies for unclear areas in coding and DRG optimization, and a knowledge of financial management principles. These skills rose more quickly than others to the top of the entry-level requirement list.

Skill Requirements for Medical Record Technicians

Technicians as a group perform a broad range of duties, including documentation analysis, coding, DRG assignment, abstracting, and handling medical and legal requests for information. However, individual technicians often concentrate in a specialized area such as coding/abstracting or information release. A few technicians work with medical registries to classify particular kinds of diseases, and some move into medical transcription. With experience, technicians may become supervisors, particularly in technical areas.

Because of recent changes in the field, some shifts in job responsibilities have occurred. In particular, coding has become an important area of expertise. In addition, some technicians have assumed data processing and report writing responsibilities and have performed quality assurance procedures. Finally, technicians have worked more frequently with people outside of medical records, especially with physicians and other allied health staff.

Just as changes occurring in the medical record field have created a shift in job responsibilities, they also have had a significant impact on the skills required in technician jobs. Our survey results indicated that changing reimbursement requirements, an expanded regulatory scope, and new technologies pushed technical and technology skills to the forefront of the occupation. In particular, technicians reported that both the ability to code inpatient records and to use an integrated computer system gained more than any other skill in recent years. Skills that were not in technical or technology areas but that also gained in importance included both the ability to handle research requests and to use judgment when confidentiality and DRG procedures were unclear.

Although most of the changes occurring in the field brought with them the need for more specialized knowledge, technicians continued to need a solid grounding in basic skills and in general medical record science to perform their work. For both entry-level performance and job advancement, such basic skills as communication, math, science, and a strong foundation in confidentiality issues and professional ethics were indispensable. At the entry level, technicians actually valued basic and general medical record skills over those that were more specialized. For instance, a solid background in relevant sciences was considered more important than the ability to code records or a knowledge of specific coding systems. Similarly, the ability to communicate over the phone was more important than the ability to handle legal court orders. Technicians were required to have a greater repertory of specialized skills only for job advancement.

The Skills Needed for Entry Level

As summarized above, technicians were required to have more basic or general medical record science skills for entry-level job performance, rather than those that pertain to specific duties or tasks. These basic skills were in the areas of communication, interpersonal relations, mathematics, science, computer knowledge, professional ethics, and confidentiality laws and policy. In contrast, the next tier of skills needed for entry-level positions involved the broad range of tasks that technicians perform, including record analysis, coding, DRG assignment, abstracting, handling different requests for information, and using computer applications specific to medical record procedures. Among these skills, technicians mentioned a knowledge of ICD-9 and CPT-4 codes and the ability to use a computerized grouper to assign DRGs. Although second to a strong general preparation, technicians considered many specific skills, knowledge, and abilities as *moderately important* for entry-level performance.

With very few exceptions, technicians identified the skills clustered in the Technical, Technology, and Information skills categories as either *very* or *moderately important* for entry-level job performance. The exceptions included such specialized areas as both knowledge of ICD-O (oncology) codes and computer programming, which were considered only *somewhat important.* By contrast, technicians identified very few supervising skills as either *moderately* or *very important* for entry-level. The few supervising skills that were important tended to pertain to critical thinking or to the day-to-day operations of the department such as scheduling. Technicians considered the more advanced supervising skills, particularly those pertaining to setting policy or training staff, as less important for entry-level performance.

The Skills Needed for Advancement

There are three typical career paths for hospital technicians. If technicians take the first path, they advance into supervisory positions, particularly in technical areas, or may even become the director of a smaller hospital's medical record department. In the second case, they move out of the hospital environment to do contract or consulting work. Finally, a number of technicians remain in the occupation for years, although they may advance somewhat with respect to responsibility and pay scale. For technicians working outside of the hospital, fewer career path opportunities exist, however. Generally, in nonhospital settings such as long-term care facilities, technicians are the sole employees responsible for managing medical records. Although some technicians may take on greater quality assurance responsibilities, advancement for many means moving into a hospital or consulting situation.

It is important to note that in order to follow any of these career paths, a technician generally needs to develop technical expertise. This is true whether a technician remains as a coder for sixteen years, leaves the hospital to join a consulting firm or coding agency, or becomes a DRG coordinator. In contrast, only a minority of technicians need or want to acquire supervising or general management skills for advancement.

The survey results indicated that for job advancement, hospital technicians were required to have the same basic and general skills that were needed for entry-level performance as well as the next level of skill specialization. For instance, in the area of Technical Procedures, technicians added the more specialized skills of abstracting and coding and a knowledge of ICD-9 codes and DRGs to a general sciences background. With respect to technology, technicians needed a broader knowledge of computer information systems, hardware, and software, in addition to a familiarity with computer use. Finally, among information skills, technicians added to basic communication skills the ability to handle legal and research requests for information. While advancement required the next level of specialization after basic skills, it did not require the most specialized or technical skills. Technicians identified skills such as coding laboratory procedures, handling HIV requests, and using particular computer applications as only *moderately important* for advancement.

Once again, technicians considered the overwhelming number of skills clustered in the technical, technology, and information skill categories to be either *very important* or *moderately important* for job advancement. There were only a few exceptions such as skill in transcription which were only *somewhat important.* However, unlike the situation for entry-level performance, technicians included all supervising skills among those that were *moderately important* for advancement.

Changes in Skill Requirements

Changes in the medical record field have made technical and technology skills paramount for technicians. In particular, technicians identified four skills as having gained more in importance than others in recent years: the ability to code inpatient records, knowledge of ICD-9 and CPT-4 codes, and the ability to use an integrated computer system. In addition to these *much more important* skills, industry changes raised the status of many other skills. For instance, changing reimbursement requirements and an expanded regulatory scope increased the importance of DRG assignment, additional areas in coding, documentation requirements, and the abstracting of information. New technologies brought about a gain in the importance of general knowledge about computers and the use of specific computerized medical record applications. Finally, a greater demand for information increased the importance of research requests, report writing, communication, and knowledge of confidentiality laws and policies.

Technicians considered the vast majority of skills clustered in the technical and technology skill categories to be *much more important* or *more important* to their occupation than they were several years ago. By contrast, information and supervising skills gained relatively less in importance, with the majority of these skills considered only *somewhat more important*. Among these less dynamic skills, technicians included such rudimentary skills as the ability to speak, read, and write English and a knowledge of basic math, as well as more advanced skills such as epidemiology and setting coding policies.

Important Entry-Level Skills That Have Gained in Significance

Many of the skills required for entry-level performance in technician jobs have also recently gained in significance. These included most technology, technical, and Information skills. However, technicians indicated that one skill, the ability to use an integrated computer system, was among both the most important skills for entry-level and those that gained the most in recent years. More than any other skill surveyed, this one surpassed the others for entry-level performance.

Skill Requirements for Medical Record Clerks

Hospital clerks perform a range of duties, from basic filing to handling legal correspondence to supervision. As mentioned previously, clerks file and pull records and file documentation into those records. They also deliver and track the records, take phone orders for charts, and enter the orders into a manual or computer system. Higher level clerks may respond to legal requests for information; others become supervisors and may be responsible for overseeing personnel and filing operations. In some hospitals, clerks perform some technician duties such as analyzing charts for documentation deficiencies and coding medical information. While the trends occurring in health care have primarily changed how clerks performed their jobs, including the use of computer technology and greater contact with people outside the department, these trends have also increased the number of technical skills that clerks performed at more advanced levels.

The survey results indicated that changing skill requirements reflected the shifting job responsibilities of clerks. Above all, the introduction of new technologies into the medical record field made it *much more important* that clerks be familiar with computers. In addition, technical skills and the ability to work with people were among the skills to gain the most in importance in recent years. Clerks were also required to use more information skills, including the knowledge of confidentiality issues and the ability to work with other hospital departments. Although clerks reported that the skills most important for entry-level performance were fairly rudimentary skills such as the ability to communicate and to file records, they also indicated that for job advancement they needed more specialized skills.

The Skills Needed for Entry Level

Similar to technicians, clerks reported that the skills most important for entry-level performance tended to be basic or introductory skills. These included the ability to communicate, to work with other people, to file records, to enter information into and retrieve information from a computer, and to follow confidentiality procedures. By contrast, the next tier of skills pertained more to specific medical record functions. Clerks included the following among these *moderately important* skills: chart assembly and analysis, coding and DRG assignment, knowledge of relevant sciences, the use of a number of computer applications, and the handling of various requests for information.

With few exceptions, clerks reported skills as either *very* or *moderately important* for entry-level performance. The skills considered only somewhat important tended to pertain to legal requests for information or to the training and supervision of other clerks. They identified only one technical skill, the ability to do transcription, as relatively less important for entry level.

The Skills Needed for Advancement

Clerks generally advance through a series of clerical tasks such as filing and taking orders for charts. Eventually, clerks may be responsible for documentation analysis or legal correspondence, or may even learn coding. For clerks, common career paths include becoming a clerical supervisor, moving into a technician position, or moving out of the medical record department into a clerical or receptionist position in another department of the hospital. For the most part, acquiring technical expertise provides the best opportunity for advancement for the greatest number of clerks.

Generally, clerks needed the same basic skills for advancement as they did for entry-level performance, with one exception in the area of communication. Although entry-level performance required the ability to communicate through speaking and reading, clerks indicated that writing was a skill that became particularly important for advancement. Moreover, job advancement also required skills that pertained more to specific medical record functions. Specifically, clerks added several technical and Information skills to the list of *very important* skills, including record analysis, coding, abstracting, knowledge of relevant sciences, and the ability to handle various requests for information. By contrast, skills that were even more specialized such as knowledge of CPT-4 codes and the uses of specific computerized medical record applications tended to be only *moderately important* for advancement. Finally, in addition to basic and specific medical record skills, clerks identified a greater use of judgment as necessary for advancement. Specifically, clerks could no longer simply follow confidentiality procedures, but were required to use their judgment when procedures were unclear.

Clerks reported virtually all skills as *very* or *moderately important* for advancement. In addition, more than any other skill categories, technical skills and the ability to work with other people tended to be at the high end of the scale. Clerks considered the ability to supervise other clerks as less important as a path to advancement than they did proficiency in technical and information procedures.

The Skills That Have Recently Gained in Importance

Changes in the medical record field have moved technology skills to the forefront of clerk jobs. For example, clerks reported that it was *much more important* that they be familiar with computers and, in particular, that they be able to use a computer keyboard, to use an integrated computer system, and to retrieve information from a computer. In addition to technology skills, clerks indicated that technical and information skills and the ability to work with people also gained in importance. These ***more important*** skills included record analysis, coding, abstracting, knowledge of confidentiality issues, and communication with medical staff, as well as working with other hospital departments, as a member of a team, and with a multicultural staff. The skills that remained more static included most clerical procedures and a number of information skills.

Important Entry-Level Skills That Have Recently Gained in Significance

Many of the skills required for entry-level performance in clerk jobs also gained in significance in recent years. These included a large number of technology, technical, and information skills. However, many of these skills were only ***moderately important*** for entry-level performance or had gained only a moderate amount in importance. Among the *most important* entry-level skills, the survey revealed that both the ability to use a keyboard and to retrieve information from a computer were the only skills that also became ***much more important*** in recent years. These two technology skills rose more quickly than the others to the top of the skills needed for entry-level performance.

Responding to Industry Needs in Medical Records

As stated in previous sections, the skills, knowledge, and abilities necessary for effective job performance are acquired through a combination of formal education, work experience, and on-the-job training. However, at the entry level, formal education is far more important than these other factors in shaping employees' abilities to perform on the job. Consequently, when filling entry-level positions, employers rely heavily on educational institutions to produce students who meet their skill requirements. Employers also depend on educational institutions to fulfill their staffing needs in terms of the number of employees who are trained for various positions. Although recruitment of staff from other geographic areas and of professionals who are relocating also affect the success of staffing programs, at the entry level, local educational institutions play an especially important role.

The following units of this report address whether or not the staffing needs of the health care industry for medical record professionals are being met by Bay Area educational institutions and whether or not new employees have the skills that employers require.

The Shortage of Medical Record Personnel

Health industry employers repeatedly state that they have difficulty finding qualified medical record personnel in the San Francisco Bay Area. There are two explanations for this lack of qualified personnel: (1) there is a scarcity of applicants and (2) applicants are not sufficiently qualified. This section addresses the scarcity of medical record professionals and the role that program availability plays in this shortage. The problem of insufficient qualifications among applicants will be addressed in the next section, which discusses the match between skill requirements and training.

Evidence of Shortages in the Bay Area

Evidence of the scarcity of medical record professionals in the Bay Area appears at both the administrator and technician levels. In the case of administrators, hospitals report that they are often forced to recruit RRAs from outside the Bay Area and the state. In the case of technicians, the California Employment Development Department found in 1990 that employers had consistent difficulty finding ARTs with several years of DRG experience (Bay Area Council, 1990, p. 32). As a result, hospitals frequently leave vacant ART positions open for months at a time. In particular, all of the medical record administrators interviewed for this study agreed that there was an acute shortage of experienced coders.

Our research indicates that one specific way the shortage of personnel has manifested itself is that the job responsibilities of technicians and clerks have increased. Due to the shortage of RRAs, some hospitals and HMOs employ ARTs in their director positions, although they would prefer hiring a baccalaureate-level candidate. Because of the lack of ARTs, some administrators assign tasks that ARTs previously performed to nonaccredited personnel. For instance, most hospitals surveyed now have their clerks analyze charts. Similarly, some hospitals train in-house personnel to be coders and save their ARTs for supervisory positions. In contrast to several years ago, hospitals now consider hiring applicants who have completed a short-term coding certificate program for their coder positions, whereas previously they may have only considered ARTs.

Program Availability in the Bay Area

There is a simple explanation for the scarcity of medical record personnel in the Bay Area: an insufficient number of programs exist. While it is probable that the Bay Area would benefit if an administrator program were created and a technician program were added, the situation is more complex due to the prohibitive cost of private schooling and the underenrollment in existing educational programs.

Medical Record Administrator Programs. Currently, there is no medical record administrator program in the Bay Area. In fact, only one accredited program exists in California, at a private university in the Los Angeles area. However, an alternative, independent study program is available through a private college in Missouri.

While it is possible that the southern California and out-of-state programs could meet the needs of Bay Area employers for RRAs, there are several major drawbacks to this solution. First, the most obvious problem is geographic distance for Bay Area residents. Even the four-year independent study program requires several weeks of residency in Missouri during each year of attendance. Second, both accredited programs are offered at private institutions and, therefore, are relatively expensive. 1990 figures indicate that tuition for completion of either four-year program would cost more than $20,000. When compared with the approximate $1,000 per year state university tuition, a bachelor's degree in medical record administration is not competitive with other allied health degrees. Third, while some hospitals may be content recruiting RRAs from outside the Bay Area because there is no local program, hospitals cannot have any input into the program from which they recruit. Finally, the absence of an RRA program means that there is no ART progression program in the area. Thus, ARTs who are interested in job advancement through obtaining an administrative degree have no local opportunities for earning a bachelor's degree in medical records.

Most of the administrators interviewed for this study believed there was a need for an affordable medical record administrator program somewhere in the Bay Area, specifically at one of the state universities. Although turnover in the occupation is low, some growth is expected in hospitals in coming years. In particular, interviewees pointed out that RRAs are moving into quality assurance, utilization review, and risk management, as well as hospital administration. Furthermore, the experience and expertise of RRAs is expected to be needed more by consulting agencies, insurance companies, and public health organizations, as well as in other health care settings.

Medical Record Technician Programs. Currently, there is only one accredited medical record technician program in the Bay Area, at Chabot College in the East Bay. The long-standing San Francisco City College program recently lost its accreditation, but plans to make the necessary changes to gain it back. Both of these schools are public community colleges.

Until the current academic year, there were two functioning, accredited ART programs in the Bay Area, one located on each side of the Bay. The fact that there are so few local programs does not appear to be the main factor contributing to the scarcity of ARTs. However, if the City College program does not regain its accreditation quickly, the shortage will likely worsen. Instead, the main problem seems to be that the existing ART programs have not been filled to capacity. There are several possible explanations for this scarcity of applicants, including lack of information among prospective students about the medical record profession, lack of competitive salaries, and inconvenient class times.

Medical record professionals believe that one of the main reasons that so few students are entering medical record technician programs is that people still hold an outdated image of the medical record occupation as a paper-pushing clerical occupation. As a strategy to recruit more prospective students, educators plan to promote the more modern image of "health information technology" and stress that the field is a true "profession."

Another reason that professionals cite for the scarcity of students is uncompetitive medical record salaries. Directors of community college admissions report that within the allied health field, nursing and dental hygiene programs are so popular that they frequently have to turn students away because of capacity limitations. Moreover, the directors point out that salaries for graduates from these fields are very attractive, with newly hired nurses sometimes receiving bonuses of several thousand dollars and with dental hygienists earning high hourly rates, often on a percentage basis. While no formal salary analyses have been conducted, administrators and technicians alike complain about low pay scales for medical record personnel relative to other allied health and nonhealth careers.

One final factor affecting the scarcity of medical record technicians is inconvenient class times. Although San Francisco City College offers medical record technology courses in the evenings and on weekends, Chabot College does not. Because the medical record field attracts many nontraditional students, the flexibility of class times is especially important. Educators report that medical record students generally do not enter the program immediately after high school. Instead, the students tend to be older women who are either returning to the work force or making a career change. In particular, a number of students also enter medical record programs after being introduced to the occupation while working in a hospital setting. Although some hospitals allow their employees to take daytime classes, others do not. Finally, the scarcity of evening and weekend classes may impede career mobility for some people.

In summary, lack of information about the profession, lack of competitive salaries, and inconvenient class times are all likely contributors to underenrollment in the existing medical record technician programs. However, this does not mean that additional technician programs might not be needed in areas that are currently geographically isolated from San Francisco City College and Chabot, specifically, in the heavily populated South Bay. Although City College and Chabot graduates work in hospitals that are widely scattered throughout the Bay Area, it is possible that the educational programs do not attract prospective students from more distant locations. Educators report that community college students are sometimes reluctant to make long commutes to attend school, especially if they are also working or taking care of families, although this is not always the case. Ultimately, individual community colleges may be able to assess whether or not there is an untapped local reserve of prospective students.

The Match Between Skill Requirements and Training

Data gathered in this study from interviews, focus groups, and survey responses provided several pieces of evidence concerning the skill areas where new medical record employees had either adequate or insufficient training. In every interview with supervisory and administrative personnel, medical record experts were asked about areas in which their newly hired employees showed skill deficiencies. In addition, participants in the medical record focus group were also asked about these areas of deficiency. Finally, all survey respondents were requested to indicate what skills or knowledge they needed to perform in their jobs that they did not learn in school, or those that they did learn which were not necessary for job performance.

The findings on the match between skill requirements and training can aid educators in evaluating how current their programs are and in deciding what changes if any should be made. It is important to note, however, that the medical record personnel interviewed and surveyed for this report attended a variety of educational institutions over a period of more than two decades. Thus, the strengths and weaknesses they recognized in their training may not apply to any one institution, and in some cases, program changes may have already been made or may be planned for the near future.

Medical Record Administrators

The administrators interviewed and surveyed for this study repeatedly indicated that they lacked sufficient preparation in certain interpersonal, general management, and technology areas. The most common complaint was that they did not have adequate supervising skills to handle difficulties that arose with their employees. In addition, they wished that they had acquired better negotiating skills, for instance, to work with unions. With respect to general management skills, administrators singled out an inadequate amount of training in budgeting and financial management. Finally, administrators wanted a better knowledge of the use of computer technology to improve their job performance.

There was some disagreement among administrators about the importance of receiving training in coding. On the one hand, some administrators considered the ability to perform coding procedures as unnecessary, emphasizing instead a general knowledge of coding. In contrast, other administrators valued the coding training they received. As one medical record director stated, "Coding was very helpful to me because it gave me a better idea of what my staff was doing." Another administrator found that practical knowledge of coding was indispensable for evaluating the quality of coding and DRG assignment in her department. In part, this disagreement over the importance of practical coding experience may stem from differences in management styles. Some administrators may prefer to rely on technical supervisors to monitor coding procedures and answer detailed questions.

Medical Record Technicians

The study findings revealed that technicians, like administrators, placed interpersonal and communication skills at the top of their list of skills for which they did not receive adequate training. Some felt they lacked an ability to communicate with people in general, while others specified that they needed to learn how to communicate with patients and physicians, especially over the phone. Along with interpersonal skills, technicians believed they lacked adequate training in computer skills.

However, with respect to technical skills, technicians were divided on which skills were important and which were not. Roughly the same number wished they had received more advanced training in coding, as the number that found their coding training unnecessary. Similarly, some wished that they had been more prepared in sciences, including pharmacology, disease processes, and clinical procedures, whereas others felt their science background was adequate. This diversity of opinion can be explained primarily by the moderate degree of specialization of technician jobs. For example, coding became an area in which many technicians concentrated, especially with the advent of DRGs. Thus, these technicians needed a more precise understanding of coding and a broader background in the sciences. On the other hand, technicians who did not choose to develop an expertise in coding, and instead focused on record analysis or release of information, found they did not use the coding they had learned. Similarly, a number of technicians found transcription to be unnecessary in their jobs. While those who concentrated in transcription would disagree, other technicians did not use that skill.

Medical record administrators agreed with the technicians' assessments of their own inadequacies in interpersonal and communication skills. However, there were two areas in which they disagreed. The first pertained to the importance of supervising skills. Relatively few technicians reported that they lacked supervising skills. In contrast, administrators bemoaned the lack of supervisory training among their technicians. In part, this may be explained by the fact that technicians perceived supervisory skills to be relatively less important for job advancement than strong technical skills. It is unclear, however, whether this discrepancy is caused by a lack of information on the part of technicians as to what is required for advancement, or by a lack of interest in pursuing that career path. The second area of disagreement was over the technicians' preparation in coding. Whereas some technicians emphasized the need for advanced training in coding, administrators emphasized the importance of hands-on experience. In fact, administrators indicated that they would prefer entry-level coders to have had greater experience in addressing the actual questions that come up when coding actual patient records, rather than having them receive additional classroom training.

Medical Record Clerks

Like administrators and technicians, medical record clerks overwhelmingly singled out interpersonal skills as the area in which they lacked adequate preparation for their jobs. Second to the ability to communicate with peers, patients, medical staff, and the full array of requesters of information, clerks also wished they had received more preparation in computer skills. Because clerks generally entered medical record departments immediately after high school and did not often participate in high school-level vocational programs in the medical clerical fields, their lack of training did not reflect on Bay Area medical record programs. However, when asked to list the additional skills that would improve their job performance, clerks indicated that coding, computer, and supervising skills were the most important. These areas reflected the job advancement opportunities generally open to medical record clerks.

Conclusions

The medical record field has undergone a significant transformation in recent years, from previously being relegated to a forgotten part of the hospital to playing an integral role in many health care settings today. When health care professionals seek answers to medical, financial, and other information questions, they often turn to the medical record department.

While stricter reimbursement requirements, an expanded regulatory scope, new technologies, greater demand for information, and a cost containment mandate have all raised the status of the medical record profession, they have also effected changes in the job responsibilities, work environments, and skill requirements of medical record professionals. As a result, Bay Area employers have demanded both more personnel and an increasing level and diversity of skills from administrators, technicians, and clerks.

Currently, the supply of personnel in the Bay Area does not meet local labor demands for either quantity or quality. The shortage is most acute for coders, but also exists for other technicians and administrators. Unfortunately, it appears that employers will have to continue looking for administrators outside of the Bay Area for some time and will also have to hold technical positions open for long periods. While many professionals advocate that a medical record administrator program be created in one of the state universities in the Bay Area, the current fiscal situation of California's public education system will make that difficult. In terms of medical record technician programs, it will take a while for educators to remove one of the main causes of underenrollment, the lack of information among prospective students about the profession.

However, several avenues are open to professionals and employers who are interested in increasing the supply of medical record personnel. In the case of administration programs, other California educational institutions, particularly California State University in Los Angeles, have wrestled with the problem of lack of public funds and have developed some innovative strategies, among them are the following: (1) creating an ART progression program before establishing a full four-year RRA program; (2) creating a program within an existing department such as business administration or computer information science, and offering a specialty in health information administration; and (3) beginning as a certificate rather than a degree program. Although it is possible that none of these strategies will ultimately be successful, further dialogue may lead to a solution. In any case, it is certain to be a number of years before students will be graduating from a Bay Area medical record administration program and will be entering the local labor force.

In the case of technician programs, educators can pursue several strategies to increase the number of students applying to and graduating from local programs. Most importantly, San Francisco City College should do everything it can to regain its accreditation status. In addition, when trying to change the image of the medical record profession among prospective students, educators may want to target high school students or other labor market entrants who express an interest in computers, communications, or information systems. Another strategy would be to emphasize the range of settings in which medical record professionals work. Moreover, when targeting the health field, educators may want to offer informational sessions to medical record clerks or other allied health professionals. Finally, greater cooperation with local health care employers is probably a wise strategy.

Because the medical record technician occupation attracts a number of nontraditional students, educators could encourage enrollment by offering evening or weekend classes. In addition, by creating certificate programs in clerical procedures or coding that overlap with technician program requirements, educators could provide manageable career stepping stones for nontraditional students. Finally, because some community college students prefer not to travel very far to school, there may be room for a third medical record technician program in the South Bay. Clearly, the potential for increasing the number of graduates from local medical record technician programs is much greater than it is for administration programs, and positive results could reasonably be expected during the next several years.

Accompanying the shortage in the supply of personnel, medical record professionals state they lack some of the skills necessary for satisfactory performance in their jobs. In part, this lack of adequate preparation is a direct result of the rapid changes occurring in the field that have shifted job responsibilities and skill requirements. However, unlike some of the broader supply and demand problems facing medical records in the Bay Area, adjustments in program design should be a manageable goal. In fact, educators may be able to use the findings in this report to identify inadequate or unnecessary areas in training programs.

Overwhelmingly, clerks, technicians, and administrators indicated that they lacked sufficient interpersonal skills. On the one hand, administrators wanted to acquire better supervising skills, especially for handling difficult employee situations, as well as improved negotiating skills. On the other hand, technicians and clerks wished they had been more prepared to work with patients and medical staff. This lack of preparation is further underscored by the fact that in this study interpersonal and communication skills were found to be among the most important skills for entry-level job performance and advancement. Specifically, administrators needed a number of interpersonal skills for entry level, including the ability to motivate staff, manage a multicultural staff, and communicate with a variety of hospital departments. Similarly, technicians and clerks identified the ability to communicate in writing and over the phone, especially with medical staff, as crucial to entry-level performance.

The second skill area that clerks, technicians, and administrators agreed was lacking in their training was computer skills. Although the three occupations required varying levels of skills, the general field of computer knowledge was critical to all of them. Administrators were required to have a more sophisticated understanding of the capabilities of computer information systems and of various applications, while clerks needed only the more basic ability to use a keyboard and to enter and retrieve information. The lack of computer skills proved to be a particularly critical problem because these skills were also among the most important for entry level and advancement. Administrators especially required a broad range of knowledge about computers even for entry-level performance, including such relatively advanced skills as the ability to develop integrated computer systems and a knowledge of computer hardware and software.

Although technical skills such as coding and DRG assignment have become much more important in the medical record field in recent years, expertise in this area is not necessary for all personnel working in the field. For example, administrators must have enough knowledge of coding to be able to set department policies; however, they do not necessarily have to know how to code and assign DRGs themselves. Although some practical experience may be useful for setting policy and assuring the quality of procedures, not all administrators valued this training. The disagreement over the importance of practical training in coding suggests that students in medical record administrator programs may benefit from the opportunity to concentrate in a technical area, choosing from among coding, transcription, information release, or other courses.

In the case of technicians, job specialization means that some technicians may need a strong preparation in coding, while others may rarely use this training. Similarly, some may need a solid preparation in transcription, while others will never use this skill outside of school. Because of job specialization some medical record technician programs might consider offering a menu of courses, allowing their students to concentrate in a particular area after having been exposed to a range of job functions. This would permit some students to take advanced coding and additional sciences, whereas others might take extra classes in transcription, and still others, classes in release of information, statistical analysis, and report writing. However, the advice of medical record administrators should be remembered: Practical experience is often more valuable than additional coursework. Ultimately, educators may be able to work with employers to find innovative ways to address this problem.

Perhaps the greatest lesson that can be learned from this research is the benefit that can be gained from health care educators and employers working together. This study was only able to produce a one-time assessment of the match between employer needs and employee training, or more precisely, between skill requirements in medical record jobs and the skills of personnel. An ongoing dialogue among educators, employers, and interested professionals not only might keep the match between education and employment up-to-date, but also might lead to innovative solutions for the many problems raised in this study. However, what is certain is that the medical record field will continue to evolve and change as the pressures on the health care industry mount. All indications are that the medical record or health information profession will continue to grow in stature through the end of the century.

MEETING INDUSTRY NEEDS THROUGH HEALTH OCCUPATIONS VOCATIONAL PROGRAMS

Introduction

This final section has two objectives. The first is to summarize the major educational policy implications that have emerged from this study of occupational change in health care occupations and to translate them into concrete goals for vocational education. The second is to identify specific educational policies and program planning issues that have surfaced from the study and warrant future attention. To achieve both objectives, this discussion draws on specific findings from this research and on the results of other related studies.

New Goals for Vocational Education and their Application to Health Occupations

Education has always been charged with the responsibility of preparing individuals for the demands they will face when entering the work force. With social and economic factors increasing the skills required of workers in nearly every sector of the American occupational structure, throughout this century these workplace requirements have undergone a slow but steady evolution. However, over the past two decades these changes have accelerated because new forces have emerged, transforming the nature of many jobs.

The most important among these forces have been (1) the explosive growth of new technologies that have created new jobs and dramatically reshaped the content and requirements of some existing jobs; (2) the frequent shifts in product and service lines demanded by the marketplace that have created rapid changes in employers' skill requirements; and (3) the growing need for higher productivity throughout the U.S. work force, brought about by increased competition between American industry and lower-wage foreign competitors. Faced with these trends, many employers have been demanding more highly skilled and flexible employees at various entry points in the occupational ladder.

This does not mean, however, that every occupation has experienced changing skill requirements or that every job will require a college education in the future. In fact, by the year 2000, seventy percent of jobs in the United States will still require less than a college degree (Commission on the Skills of the American Workforce, 1990, p. 26). However, throughout the entire range of occupations, from jobs that typically require high school graduation to those demanding post-baccalaureate education, technical and nontechnical job requirements for beginning workers have increased and are expected to grow more in the future.

Although demands for greater productivity have risen, the response of American industry has generally been inadequate. Throughout the 1980s, U.S. productivity growth was weak, especially in the burgeoning service sector of the economy (Johnston & Packer, 1987). To turn this situation around, employers have increasingly looked to educators to provide answers to the productivity problem, or they have joined with educational institutions to seek a solution.

The education community has responded by taking action at the federal, state, and local levels to define more clearly the skills required at various occupational entry points and to reshape curricula in secondary and postsecondary programs to meet these requirements. In turn, many vocational educators have taken this challenge a step further by reassessing and redefining the goals of vocational education.

New Goals for Vocational Education

Traditionally, many individuals have expected the vocational educational system to prepare students with the specific skills that match entry-level job requirements. However, in recent years there has been increased pressure on vocational educators to expand this mission. Demand for greater productivity; rapid expansion of the small business sector, which has limited resources to train its employees; and increasing needs for ongoing training and skill upgrading for employees in jobs that are undergoing significant technological change have all broadened the scope of vocational programs. As a result, vocational education has become responsible not only for the initial training of young people, but also for educating adults who lack job skills and for re-educating employees so that they can adapt to changing occupations.

This new mission has required vocational programs to identify strategies for preparing students for entry-level jobs, as well as for multiple job changes that will require different and often higher-level skills throughout their working lives. Students who have completed vocational programs must be ready to enter the world of work or to begin new careers with more than just entry-level job skills and the ability to read and write; they must also be able to prosper in a constantly shifting work force and economy.

The Need for Basic, Technical, and Advanced Job-Related Skills

This rapidly changing and sometimes unpredictable employment picture has had a major impact on the competencies that form the objectives of vocational curricula and on the content, structure, and pedagogic methods that are part of vocational education. Today's vocational programs, especially those in technologically advanced fields like health occupations, cannot prepare entry-level workers whose skills only match limited, technical entry-level job requirements. Of course, these workers must still have the technical skills that are required for the occupations and industries they will be entering. However, they must also have critical thinking skills that are essential for problem solving; effective written and verbal communication skills to be able to perform in more complex organizational settings; the ability to work as team members in environments that demand high productivity; and, most importantly, strong academic backgrounds that will enable them to learn on the job, as performance requirements change or as they make career shifts.

Growing Demands on Health Occupations Education

Nowhere are these needs greater than in the health care industry, where productivity gains are critical to continually improving the quality of health care while reducing health care costs. The results of this study clearly indicated that health occupations education, at both the secondary and postsecondary level, has experienced increasing demand for more highly skilled entry-level employees; for individuals who can rapidly assume the changing job responsibilities that arise from new technologies and from changing health care delivery structures; and for employees who can increase their productivity, yet use more complex treatment methods to care for seriously ill patients.

A wide range of Bay Area experts from nearly all of the thirteen occupations examined in this study indicated that entry-level skill, knowledge, and ability requirements have increased substantially over the past five years. Moreover, they indicated that many of the skills that typically were important for advancement are now critical for entry-level job performance as well. Looking ahead, these experts indicated that this trend is not expected to change in the near future.

The study's findings also demonstrated that health occupations students need a strong foundation in both vocational and academic subjects. Specifically, with rapidly expanding knowledge and new technologies in health care fields, students are required to master the traditional academic disciplines, especially in basic and more advanced sciences; to develop the technical skills, knowledge, and abilities necessary to deliver patient care or to manage medical information; and to develop a high level of competence in written and verbal communications, critical thinking, and teamwork—all of which are essential to be effective in complex, high-pressure health care organizations.

Furthermore, in many health care occupations, especially in some medical imaging and medical therapy fields, employees have assumed roles in which they are mostly independent from ongoing physician supervision, whether they work inside or outside of hospitals. This increased autonomy requires health care professionals to demonstrate much greater problem-solving ability, the capacity to apply complex information, and a higher level of technical knowledge.

Because health occupations education programs are charged with preparing employees for an industry in which higher productivity will be critical to improved health care delivery and cost containment, health occupations education programs clearly are facing greater demands from employers. However, many of these programs are also in a strong position to meet these industry requirements and, at the same time, to contribute to more effective secondary and postsecondary education. For example, health occupations curricula already have significant science requirements, and after completing these courses, students gain a firm grasp of scientific principles and the critical thinking skills underlying the scientific method.

In addition, health occupations programs frequently rely on significant input from industry advisory boards; many of their instructors are practicing health care professionals; and they have developed active partnerships with health care organizations that provide clinical placements for students. Because of this history of close education–industry interaction, health occupations programs have an advantage over other vocational fields where industry has been less heavily involved.

Nonetheless, so far health occupations programs have not entirely met the industry's challenge of increasingly complex skill requirements. On the one hand, employers participating in this study expressed generally high satisfaction with the technical skills and knowledge that new employees developed in Bay Area secondary and postsecondary health occupations programs, and also gave generally high marks to the basic and advanced science education that students received. On the other hand, these employers frequently expressed dissatisfaction with the communications skills and teamwork abilities of entry-level employees in a broad array of occupations, ranging from nurses and nursing assistants to physical therapists and physical therapist assistants. This dissatisfaction indicates that a critical need exists to increase the nontechnical components of health occupations curricula at all educational levels, and to offer students more opportunities to develop effective teamwork and decision-making skills.

Integrating Vocational and Academic Education

The question of how health occupations programs can reshape their curricula to improve students' communications skills and teamwork abilities must be addressed. In reviewing descriptions of health occupations curricula from Bay Area community colleges, study staff learned that in many programs very little emphasis was placed on courses such as speech or writing, which explicitly focus on communications skills. Thus, the most obvious answer to this problem would be to increase the number of communications courses students are required to take for program completion.

However, many of these health occupations curricula are already much longer in duration than when they were originally designed, mostly because it takes more time for students to master the growing body of scientific and technical material. As a result, students frequently take three or more years to finish two-year community college programs and five or more years to finish baccalaureate programs. Study participants often cited the longer duration of many health occupation programs as a major enrollment disadvantage, especially since students could complete other programs offering good career prospects in shorter amounts of time.

Just adding more courses will not solve this problem. Employers of physical therapists and baccalaureate-trained registered nurses indicated that students completing B.S. degrees also lacked effective communication skills. Obviously, even the larger number of courses requiring written assignments or class presentations in longer baccalaureate programs have not resolved this communications skills gap.

Instead, new pedagogic approaches that bring together vocational and academic teachers for joint curriculum planning may be a more effective way for health occupations programs to introduce additional material on subjects such as communications into the technical curricula. Similarly, enriching basic science, math, and communications courses by concentrating on health-related material can enhance classroom experience and improve both vocational and nonvocational students' opportunities for learning. Several California secondary-level health academies have already experienced considerable success with these kinds of efforts, and they should be implemented in postsecondary programs as well.

Avoiding Future Labor Market Shortages: Expansion and Innovation in Health Occupations Programs

Health occupations programs in the San Francisco Bay Area have also failed to meet the region's recent and current needs for trained professionals in a variety of occupations. One of the study's most consistent findings across nearly all thirteen health occupations was the substantial magnitude of personnel shortages in the Bay Area and projections that these shortages are likely to remain or increase in the future. In other recent research conducted by the Bay Area Council (1990), the Institute of Medicine (1989), and CAHHS (1988), these findings held for the Bay Area, as well as for other areas of the state and the country. However, these studies also indicated that wide regional variations in the extent of future personnel shortages may be present.

Due to recently improved salaries and today's weak economy, in some occupations like nursing, shortages appear to have temporarily abated in certain areas. A weak economy typically encourages some employees who prefer part-time work to accept full-time employment and prompts contract employees to seek salaried jobs. These conditions also reduce demand for personnel because health care utilization declines and health care organizations respond with hiring freezes.

However, this study was not concerned with temporary fluctuations in enrollments or demand brought about by cyclical economic factors. Instead, the research focused on identifying future needs and developing policies for health occupations education that will address *longer-term* requirements of personnel who can provide quality health care. Our results, including population and utilization projections, suggest that long-term demand for health care services will increase in the future at a rate that cannot be met by the current supply of personnel.

New and Expanded Educational Programs and Approaches

There are several mechanisms through which expanded secondary and postsecondary health occupations programs can assume a significant long-term role in ensuring an adequate supply of personnel. Most obviously, developing more educational programs with higher enrollments for occupations that are experiencing substantial shortages will increase the pool of trained, entry-level employees.

The findings from this study strongly suggest that in several health care occupations currently there are insufficient numbers of programs and/or enrollment limitations that preclude local educational institutions from meeting current personnel requirements. These occupations include those in the entire nursing job family, physical therapists and physical therapist assistants, medical records clerks, medical records technicians, and medical records administrators. When accompanied by projected population growth in California and in the Bay Area and anticipated increases in health care utilization, these institutions will also be unlikely to meet future demands for personnel.

However, other important channels exist for augmenting the supply of health professionals that do not require new programs or increased enrollment capacity. Many of these approaches may be just as important as program expansion for increasing the supply of health professions because they can increase the total volume of applicants, expand the volume of *successful* applicants, raise graduation rates, and reduce turnover among new employees.

The Potential of Applied Academic Programs

Applied academic programs that combine education in academic subjects with concrete, work-related applications are one recent innovation that can increase the supply of health care professionals in several ways. First, cognitive learning theorists argue that carefully developed and implemented applied academic programs can improve learning and increase students' active involvement in their education because they offer challenge and relevance to vocational students who may otherwise view school as not being applicable to their future lives (Raizen, 1989). Consequently, expanding and developing new secondary-level health occupations programs, especially applied health sciences courses, should increase the pool of employees for the health care industry simply by increasing the supply of high school graduates that are motivated to pursue health care careers.

In addition, rigorous and challenging secondary-level health occupations programs will increase the proportion of successful applicants who enter postsecondary health occupations fields and will reduce dropout rates in these programs. In other words, by successfully completing these secondary-level programs, more applicants are likely to meet academic entry standards and to complete graduation requirements once enrolled.

Third, educators participating in this study from a variety of health care fields affirmed that students with previous exposure to health care settings are more successful in school. Thus, especially when programs include work requirements or clinical placements, early exposure to health care occupations and environments should encourage students who enjoy working in these settings to pursue further study. Moreover, these experiences will also help to filter out students who do not enjoy health care work so that they can pursue work in other occupational areas. This early, hands-on exposure to a set of job requirements and a work environment should serve to reduce the high dropout rates that exist in many postsecondary health programs (Rezler, 1983) and even in the early years of employment after graduation.

Finally, integrated vocational and academic programs in postsecondary health occupations programs should improve the communications and other nontechnical skills of students, thereby improving their job performance and opportunities for advancement on the job.

The Impact of Articulated Educational Programs

The expansion of coordinated, or articulated, education programs is a way in which multilevel planning for health occupations programs can increase the supply of health care professionals. This research and other studies of health professionals at various occupational levels (Friedman, 1990) have shown that many individuals already employed in health care settings are highly motivated to move into higher level occupations. Moreover, some of these studies indicate that individuals with previous health care experience demonstrate considerable persistence and have high graduation rates from continuing education programs.

Recent efforts in nursing education in California and other areas of the country have already produced an excellent model—one in which secondary and postsecondary programs are coordinated to facilitate continuing education for higher degrees and foster upward occupational mobility by eliminating duplication of course requirements. The most effective of these programs have been based on fully coordinated planning that involves secondary/adult education, community colleges, and four-year postsecondary institutions.

The nursing model can be effectively used to design similar programs in areas such as physical therapy, medical records, and medical imaging, where there is a need to encourage retention of already highly trained health care personnel. Findings from this study indicate that many individuals in health care occupations aspire to either supervisory positions, which generally require a baccalaureate degree, or to other specialized occupations, which require additional certifications or higher degrees in a health care field. These articulation efforts are especially critical in the physical therapy field, which will continue to experience severe shortages and currently lacks any structure to encourage upward mobility among physical therapy assistants holding associate degrees.

Health Occupations Policy for the Future

Programs to integrate vocational and academic education or to expand articulated health occupations curricula face several significant problems that require resolution if these efforts are to be successful. This section concludes by describing the most important of these issues.

Integrating Vocational and Academic Education While Meeting the Entrance Requirements of Four-Year Institutions

To improve students' skills development and to help resolve both current and future personnel shortages, we have argued for integrating vocational and academic education in both secondary and postsecondary health occupations programs. However, these curriculum reform efforts may conflict with the need for students to meet requirements for entry or transfer into four-year institutions. Specifically, if applied academic courses do not fulfill these entrance or transfer requirements, then such programs may achieve one set of objectives—reducing dropout rates and enhancing entry-level work skills—while at the same time failing to meet the equally important objective of enhancing students' opportunities for occupational mobility through additional education.

Thus, it is vital to address the issue of how applied secondary and postsecondary academic programs can also meet the entrance and transfer requirements of four-year institutions. However, resolving this issue will require coordinated planning and education policies that fully involve key participants from secondary schools, community colleges, and four-year postsecondary institutions.

Regional Planning for Program Placement and Expansion

Another major finding from this study concerned the highly localized nature of labor markets for health care professionals in the San Francisco Bay Area. Because of high housing costs, congested transportation corridors, and difficulties that employees face in coordinating personal demands with the round-the-clock work schedules of health care institutions, many employees do not want to relocate within the area or commute long distances. Other urban areas that experience these same demographic and infrastructure problems probably also manifest localized labor markets to some degree.

As a result of these constraints, health care facilities that are fortunate enough to be located near adult education programs, community colleges, or colleges and universities that train various health care personnel may face a relatively favorable job market with an ample supply of personnel. In contrast, facilities that are as little as fifteen miles away may experience severe shortages.

This study emphasized the fact that health care employment in the Bay Area operates in "micromarkets," a fact that those who plan for health occupations programs must take into consideration. As a result, coordinated program planning regionwide should be expanded so that programs can be placed or expanded where personnel needs exist. Such planning should be based on regular assessments of local labor market conditions that take into account employer personnel needs, trends in health care utilization rates, and the shifting population and commute patterns that almost certainly will occur in the Bay Area and other metropolitan labor markets in the future. This emphasis on utilization trends and population and commute patterns will provide a much needed long-term focus to educational program development.

Program planning should also assess localized demand for part-time programs and work with industry to support these programs. Findings from this study indicated that in several health care occupations, students are deterred by the high cost of attending full-time programs. They are not prevented from attending these programs by high tuition or fees, rather by their income requirements while attending school and the high costs of commuting and child care.

Industry and Education Partnerships

Health occupations education in California and the Bay Area has benefited from strong input from local health care facilities and from local and statewide industry associations. The health care industry has become involved in these partnerships by placing students in clinical programs, participating on educational advisory boards, developing scholarship programs, and participating in statewide planning committees. In fact, many of the participants in this study who work in both education and industry sectors cited the value of these collaborations.

However, these partnership efforts must be expanded. For example, they should also include collaborations in which industry generates ongoing data on current labor market needs that could be used by educators for planning educational programs aimed at meeting longer-term personnel requirements. In addition, industry/education partnerships could be very effective in providing part-time work opportunities for students participating in newly developed part-time and evening programs for occupations such as EKG technician, medical records clerk, nursing assistant, and physical therapy.

Summary

In summary, meeting the future needs of the Bay Area for health care professionals will require growth in existing educational programs, which can be accomplished through expanding current offerings, establishing new programs, and creating night and part-time educational opportunities. Meeting these needs will also require long-term program planning and curriculum innovation to identify and meet the personnel and skill needs of the health care industry.

Many of the efforts that could increase the personnel supply, improve the match between employer skill requirements and students' competencies, and enhance mobility opportunities for health care professionals already exist in some areas, or in pilot programs, or in a limited number of occupations. The best of these approaches such as articulated health care occupation programs, integrated vocational and academic curricula, and limited efforts to implement regional program planning, should be used as models for future activities. Finally, future efforts need to involve all levels of education and to continue strong partnerships between education and the health care industry.

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APPENDIX A
Medical Imaging Occupations Tables

Table A.1a
EKG Technician:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry
	Very Important
Procedural	Ability to monitor EKG results
	Ability to recognize and correct any technical errors and other interferences
	Skill in placing and relocating electrodes
Technical	Ability to perform CPR
	Ability to type
	Knowledge of cardiac functions and rhythms, both normal and abnormal
	Knowledge of heart disease
	Knowledge of medical terminology
	Skill in monitoring heart rate
	Ability to handle medical emergencies
Interpersonal/Communicative	Ability to apply patient care procedures/nursing skills
	Ability to communicate with nursing and support staff
	Ability to follow detailed instructions
	Ability to work as a team member with other professionals
	Ability to work independently and exercise judgement
	Skill in assessing patient condition throughout procedure and in recognizing adverse reactions
	Skill in communicating with physician
	Skill in explaining procedure to patient
	Skill in expressing empathy and relating to patient
	Skill in relaxing the patient
Administrative/Organizational	Ability to interpret physician's orders
	Skill in equipment maintenance (upkeep, simple repair/adjustments, recognition of malfunction)
	Skill in preparing report for physician review

Table A.1b
EKG Technician:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry
	Moderately Important
Procedural	Skill in operating the machinery Ability to carry out holter monitoring Ability to conduct stress testing Skill in noting sections of the test which the physician should review
Technical	Ability to take blood pressure Ability to use computer equipment Knowledge of basic sciences (chemistry, biology) Knowledge of body mechanics and leverage techniques Knowledge of electricity Knowledge of electronics Knowledge of human anatomy Knowledge of medications that could affect tests Knowledge of physiology Ability to apply basic mathematics Ability to apply algebra Ability to apply geometry
Interpersonal/Communicative	Ability to take client history Ability to supervise other staff
Administrative/Organizational	Ability to care for patients' medical equipment/support systems Ability to keep detailed records of patients, test outcomes, supplies, etc. Knowledge of medical office/hospital record keeping Ability to prepare written reports

Table A.1c
EKG Technician:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Somewhat Important**
Procedural	Skill in performing vectocardiograms (multidimensional tracings) Skill in assisting with thalium radionuclei studies
Technical	Knowledge of echocardiography Ability to apply calculus
Interpersonal/Communicative	None
Administrative/Organizational	None

Table A.1d
EKG Technician:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Not Important**
Procedural	Skill in assisting with cardiac catheterization
Technical	None
Interpersonal/Communicative	None
Administrative/Organizational	None

Table A.2a
EKG Technician:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **Much More Important**
Procedural	None
Technical	None
Interpersonal/Communicative	None
Administrative/Organizational	None

Table A.2b
EKG Technician:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **More Important**
Procedural	Ability to monitor EKG results Skill in operating the machinery
Technical	Ability to perform CPR Ability to type Ability to use computer equipment Knowledge of body mechanics and leverage techniques Knowledge of cardiac functions and rhythms, both normal and abnormal Knowledge of heart disease Knowledge of medical terminology Knowledge of medications that could affect tests Skill in monitoring heart rate Ability to handle medical emergencies

Table A.2b (continued)
EKG Technician:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **More Important**
Interpersonal/Communicative	Skill in explaining procedure to patient
	Ability to take client history
	Skill in relaxing the patient
	Skill in communicating with physician
	Ability to work independently and exercise judgement
	Skill in assessing patient condition throughout procedure and in recognizing adverse reactions
	Ability to apply patient care procedures/nursing skills
	Skill in expressing empathy and relating to patients
	Ability to follow detailed instructions
	Ability to work as a team member with other professionals
	Ability to supervise other staff
	Ability to communicate with nursing and support staff
Administrative/Organizational	Ability to interpret physician's orders
	Ability to keep detailed records of patients, test outcomes, supplies, etc.
	Ability to prepare written reports
	Skill in equipment maintenance (upkeep, simple repair/adjustments, recognition of malfunction)
	Skill in preparing report for physician review

Table A.2c
EKG Technician:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **Somewhat More Important**
Procedural	Ability to carry out holter monitoring Ability to conduct stress testing Ability to recognize and correct any technical errors Skill in assisting with thalium radionuclei studies Skill in noting sections of the test which the physician should review Skill in placing and relocating electrodes
Technical	Ability to take blood pressure Ability to apply basic mathematics Ability to apply algebra Ability to apply geometry Knowledge of basic sciences (chemistry, biology) Knowledge of echocardiography Knowledge of electricity Knowledge of electronics Knowledge of human anatomy Knowledge of physiology
Interpersonal/Communicative	None
Administrative/Organizational	Ability to care for patients' medical equipment/ support systems Knowledge of medical office/hospital record keeping

Table A.2d
EKG Technician:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance
	Not More Important
Procedural	Skill in assisting with cardiac catheterization Skill in performing vectorcardiograms (multi-dimensional tracings) and other interferences
Technical	Ability to apply mathematical concepts Ability to apply calculus
Interpersonal/Communicative	None
Administrative/Organizational	None

Table A.3a
EKG Technician:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement
	Very Important
Procedural	Ability to carry out holter monitoring
	Ability to conduct stress testing
	Ability to monitor EKG results
	Ability to recognize and correct any technical errors
	Skill in noting sections of the test which the physician should review
	Skill in placing and relocating electrodes
Technical	Ability to perform CPR
	Ability to type
	Ability to use computer equipment
	Knowledge of cardiac functions and rhythms, both normal and abnormal
	Knowledge of heart disease
	Knowledge of medical terminology
	Skill in monitoring heart rate
	Ability to handle medical emergencies
Interpersonal/Communicative	Skill in explaining procedure to patient
	Skill in relaxing the patient
	Skill in communicating with physician
	Ability to work independently and exercise judgement
	Skill in assessing patient condition throughout procedure and in recognizing adverse reactions
	Ability to apply patient care procedures/nursing skills
	Skill in expressing empathy and relating to patients
	Ability to follow detailed instructions
	Ability to work as a team member with other professionals
	Ability to supervise other staff
	Ability to communicate with nursing and support staff

Table A.3a (continued)
EKG Technician:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement
	Very Important
Administrative/Organizational	Ability to interpret physician's orders Skill in equipment maintenance (upkeep, simple repair/adjustments, recognition of malfunction) Ability to care for patients' medical equipment/ support systems Ability to keep detailed records of patients, test outcomes, supplies, etc. Ability to prepare written reports Skill in preparing report for physician review

Table A.3b
EKG Technician:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement
	Moderately Important
Procedural	Skill in assisting with thalium radionuclei studies Skill in operating the machinery
Technical	Ability to take blood pressure Ability to apply basic mathematics Ability to apply algebra Ability to apply calculus Ability to apply geometry Knowledge of basic sciences (chemistry, biology) Knowledge of body mechanics and leverage techniques Knowledge of echocardiography Knowledge of electricity Knowledge of electronics Knowledge of human anatomy Knowledge of medications that could affect tests Knowledge of physiology
Interpersonal/Communicative	Ability to take client history
Administrative/Organizational	Knowledge of medical office/hospital record keeping

Table A.3c
EKG Technician:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Somewhat Important**
Procedural	Skill in assisting with cardiac catheterization Skill in performing vectorcardiograms (multi-dimensional tracings) and other interferences
Technical	None
Interpersonal/Communicative	None
Administrative/Organizational	None

Table A.3d
EKG Technician:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Not Important**
Procedural	None
Technical	None
Interpersonal/Communicative	None
Administrative/Organizational	None

Table A.4a
Nuclear Medicine Technologist:
Skills, Knowledge, and Abilities Important Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry
	Very Important
Procedural	Skill in preparing patient for exam
	Knowledge of patient transfer and positioning
	Ability to interpret medical history for imaging implications
	Ability to check equipment, ensuring proper functioning
	Ability to prepare/measure radio-pharmaceuticals
	Skill in administration of radio-pharmaceuticals
	Skill in positioning equipment and setting controls
	Ability to record images properly
	Ability to develop image
	Skill in evaluating images for technical quality
	Ability to recognize need for additional images
	Knowledge of standard protocols for various exams
	Knowledge of proper handling and disposal of radioactive substances
Technical	Ability to apply basic math skills (volume, percentages, half-lives)
	Ability to input data into a computer
	Ability to recognize adverse medical reactions
	Ability to recognize correct and appropriate physician specifications (substance, amount, concentration, etc.)
	Ability to respond to medical emergencies
	Ability to understand and translate medical terminology
	Knowledge of cross-sectional anatomy
	Knowledge of functional systems (cardiac, skeletal, glandular)
	Knowledge of human anatomy
	Knowledge of pathology/disease progression
	Knowledge of physiology
	Knowledge of procedures for radioactive spills, contamination, and exposure
	Knowledge of radiation physics, isotopic energies, and radioactive decay
	Knowledge of radiopharmaceuticals
	Knowledge of the biological effects of radiation exposure
	Skill in patient care procedures/nursing skills

Table A.4a (continued)

Nuclear Medicine Technologist: Skills, Knowledge, and Abilities Important Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry
	Very Important
Interpersonal/Communicative	Skill in explaining procedure to patients Skill in communicating with physician Ability to assess patient condition throughout procedure (observation & communication) Ability to work as a team member with other imaging professionals Skill in communicating with nursing and support staff Skill in relieving patient anxiety Ability to work independently and exercise judgement
Administrative/Organizational	Ability to interpret physician's orders Ability to maintain equipment (upkeep, simple repair, recognition of malfunctions) Ability to monitor radiation (incl. use of Geiger counter) Knowledge of procedures and regulations concerning handling, testing, disposing, and reporting of radioactive materials

Table A.4b
Nuclear Medicine Technologist:
Skills, Knowledge, and Abilities Important Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Moderately Important**
Procedural	Skill in shielding patient organs
Technical	Ability to apply algebra Ability to apply clinical lab techniques (dilution, pipetting, injection, blood and urine sampling) Ability to apply statistics Ability to change formulas within computer procedures Knowledge of basic sciences (chemistry, biology) Knowledge of electronics Knowledge of software programs
Interpersonal/Communicative	None
Administrative/Organizational	Knowledge of the care/maintenance of patients' medical equipment/support systems Skill in keeping detailed records of inventory, use, and disposal of radioactive materials Skill in keeping detailed records of patients, procedures, and reactions

Table A.4c
Nuclear Medicine Technologist:
Skills, Knowledge, and Abilities Important Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Somewhat Important**
Procedural	None
Technical	Ability to apply calculus
Interpersonal/Communicative	Ability to supervise other staff
Administrative/Organizational	Ability to perform purchasing tasks (i.e., inventory, ordering) Ability to prepare written reports

Table A.4d
Nuclear Medicine Technologist:
Skills, Knowledge, and Abilities Important Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Not Important**
Procedural	None
Technical	None
Interpersonal/Communicative	None
Administrative/Organizational	None

Table A.5a
Nuclear Medicine Technologist:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **Much More Important**
Procedural	Ability to check equipment, ensuring proper functioning Ability to interpret medical history for imaging implications Knowledge of proper handling and disposal of radioactive substances
Technical	Ability to input data into a computer
Interpersonal/Communicative	None
Administrative/Organizational	None

Table A.5b
Nuclear Medicine Technologist:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **More Important**
Procedural	Ability to prepare/measure radio-pharmaceuticals Ability to recognize need for additional images Skill in evaluating images for technical quality
Technical	Ability to change formulas within computer procedures Ability to recognize correct and appropriate physician specifications (substance, amount, concentration, etc.) Ability to respond to medical emergencies Ability to understand and translate medical terminology Knowledge of cross-sectional anatomy Knowledge of functional systems (cardiac, skeletal, glandular)

Table A.5b (continued)
Nuclear Medicine Technologist:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **More Important**
Technical	Knowledge of physiology Knowledge of procedures for radioactive spills, contamination, and exposure Knowledge of radiation physics, isotopic energies, and radioactive decay Knowledge of radiopharmaceuticals Knowledge of software programs Skill in patient care procedures/nursing skills
Interpersonal/Communicative	Ability to supervise other staff Ability to work as a team member with other imaging professionals Ability to work independently and exercise judgement Skill in communicating with physician Skill in relieving patient anxiety
Administrative/Organizational	Ability to maintain equipment (upkeep, simple repair, recognition of malfunctions) Ability to monitor radiation (incl. use of Geiger counter) Knowledge of procedures and regulations concerning handling, testing, disposing, and reporting of radioactive materials Skill in keeping detailed records of inventory, use, and disposal of radioactive materials

Table A.5c
Nuclear Medicine Technologist:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance
	Somewhat More Important
Procedural	Skill in positioning equipment and setting controls Ability to record images properly Knowledge of patient transfer and positioning Knowledge of standard protocols for various exams Skill in administration of radio-pharmaceuticals Skill in preparing patient for exam
Technical	Ability to apply basic math skills (volume, percentages, half-lives) Ability to apply statistics Ability to recognize adverse medical reactions Knowledge of basic sciences (chemistry, biology) Knowledge of electronics Knowledge of human anatomy Knowledge of pathology/disease progression Knowledge of the biological effects of radiation exposure
Interpersonal/Communicative	Ability to assess patient condition throughout procedure (observation & communication) Skill in communicating with nursing and support staff Skill in explaining procedure to patients
Administrative/Organizational	Ability to interpret physician's orders Ability to perform purchasing tasks (i.e., inventory, ordering) Ability to prepare written reports Knowledge of the care/maintenance of patients' medical equipment/support systems Skill in keeping detailed records of patients, procedures, and reaction

Table A.5d
Nuclear Medicine Technologist:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **Not More Important**
Procedural	Ability to develop image Skill in shielding patient organs
Technical	Ability to apply algebra Ability to apply calculus Ability to apply clinical lab techniques (dilution, pipetting, injection, blood and urine sampling)
Interpersonal/Communicative	None
Administrative/Organizational	None

Table A.6a
Nuclear Medicine Technologist:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Very Important**
Procedural	Skill in preparing patient for exam
	Knowledge of patient transfer and positioning
	Ability to interpret medical history for imaging implications
	Ability to check equipment, ensuring proper functioning
	Ability to prepare/measure radio-pharmaceuticals
	Skill in administration of radio-pharmaceuticals
	Skill in positioning equipment and setting controls
	Ability to record images properly
	Ability to develop image
	Skill in evaluating images for technical quality
	Ability to recognize need for additional images
	Knowledge of standard protocols for various exams
	Knowledge of proper handling and disposal of radioactive substances
Technical	Ability to apply basic math skills (volume, percentages, half-lives)
	Ability to apply algebra
	Ability to input data into a computer
	Knowledge of software programs
	Ability to change formulas within computer procedures
	Knowledge of basic sciences (chemistry, biology)
	Knowledge of human anatomy
	Knowledge of cross-sectional anatomy
	Knowledge of functional systems (cardiac, skeletal, glandular)
	Knowledge of physiology
	Knowledge of pathology/disease progression
	Knowledge of electronics
	Ability to understand and translate medical terminology
	Knowledge of radiation physics, isotopic energies, and radioactive decay
	Ability to apply clinical lab techniques (dilution, pipetting, injection, blood and urine sampling)
	Knowledge of radiopharmaceuticals
	Knowledge of procedures for radioactive spills, contamination, and exposure
	Knowledge of the biological effects of radiation exposure

Table A.6a (continued)
Nuclear Medicine Technologist:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement
	Very Important
Technical	Ability to recognize adverse medical reactions Ability to respond to medical emergencies Skill in patient care procedures/nursing skills Ability to recognize correct and appropriate physician specifications (substance, amount, concentration, etc.)
Interpersonal/Communicative	Skill in explaining procedure to patients Skill in communicating with physician Ability to assess patient condition through procedure (observation & communication) Ability to work as a team member with other imaging professionals Skill in communicating with nursing and support staff Skill in relieving patient anxiety Ability to work independently and exercise judgement Ability to supervise other staff
Administrative/Organizational	Ability to interpret physician's orders Ability to maintain equipment (upkeep, simple repair, recognition of malfunctions) Knowledge of the care/maintenance of patients' medical equipment/support systems Ability to perform purchasing tasks (i.e., inventory, ordering) Skill in keeping detailed records of patients, procedures, and reaction Ability to prepare written reports Skill in keeping detailed records of inventory, use, and disposal of radioactive materials Ability to monitor radiation (incl. use of Geiger counter) Knowledge of procedures and regulations concerning handling, testing, disposing, and reporting of radioactive materials

Table A.6b
Nuclear Medicine Technologist:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Moderately Important**
Procedural	Skill in shielding patient organs
Technical	Ability to apply calculus Ability to apply statistics
Interpersonal/Communicative	None
Administrative/Organizational	None

Table A.6c
Nuclear Medicine Technologist:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Somewhat Important**
Procedural	None
Technical	None
Interpersonal/Communicative	None
Administrative/Organizational	None

Table A.6d
Nuclear Medicine Technologist:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Not Important**
Procedural	None
Technical	None
Interpersonal/Communicative	None
Administrative/Organizational	None

Table A.7a
Diagnostic Radiologic Technologist:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry
	Very Important
Procedural	Knowledge of patient transfer and positioning
	Skill in positioning x-ray equipment and setting controls
	Skill in shielding patient organs
	Skill in manipulation of beam
	Ability to apply radiographic exposure techniques
	Skill in recognizing abnormalities and artifacts within the recorded image
	Skill in evaluating images for technical quality
	Ability to recognize need for additional images
Technical	Knowledge of basic physics (concepts of energy, electric power/circuits, properties of x-rays)
	Knowledge of human anatomy
	Knowledge of functional systems(ex: digestive, cardiovascular)
	Ability to understand and interpret medical terminology
	Knowledge of sterile technique
	Knowledge of radiation protection standards and practices
	Knowledge of medical ethics
	Ability to recognize adverse medical reactions
	Ability to respond to medical emergencies
	Skill in patient care procedures/nursing skills
	Ability to recognize correct and appropriate physician order/specifications
Interpersonal/Communicative	Skill in explaining procedure to patient
	Skill in communicating with physician
	Ability to work independently and exercise judgement
	Ability to assess patient condition throughout procedure (observation & communication skills)
	Ability to work as a team member with other imaging professionals
	Skill in relieving patient anxiety
Administrative/Organizational	Ability to interpret physician's orders
	Knowledge of the care/maintenance of patients' medical equipment/support systems

Table A.7b
Diagnostic Radiologic Technologist: Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Moderately Important**
Procedural	Skill in preparing patient for exam Ability to develop image Ability to prepare contrast mediums Skill in administering contrast mediums to patients Ability to assist in cardiovascular studies
Technical	Ability to apply basic mathematics Ability to apply algebra Knowledge of basic sciences (chemistry, biology) Knowledge of cross-sectional anatomy Knowledge of physiology Knowledge of pathology/disease progression Computer skills keyboard skills software programs Knowledge of radiobiology
Interpersonal/Communicative	None
Administrative/Organizational	Skill in loading film/changing chemicals Ability to maintain equipment (upkeep, simple repair, recognition of malfunctions) Skill in keeping detailed records of patients, films, supplies, etc. Ability to prepare written reports

Table A.7c
Diagnostic Radiologic Technologist:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry
	Somewhat Important
Procedural	None
Technical	Ability to apply geometry Ability to apply statistics Computer programming skills Knowledge of radiopharmacology
Interpersonal/Communicative	Ability to supervise other staff
Administrative/Organizational	Ability to perform purchasing tasks (of supplies, etc)

Table A.7d
Diagnostic Radiologic Technologist:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry
	Not Important
Procedural	Ability to properly record images
Technical	Ability to apply calculus
Interpersonal/Communicative	None
Administrative/Organizational	None

Table A.8a
Diagnostic Radiologic Technologist:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **Much More Important**
Procedural	None
Technical	Keyboard skills Knowledge of medical ethics
Interpersonal/Communicative	None
Administrative/Organizational	None

Table A.8b
Diagnostic Radiologic Technologist:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **More Important**
Procedural	Ability to assist in cardiovascular studies Ability to assist in flouroscopy studies Ability to recognize need for additional images Skill in evaluating images for technical quality Skill in positioning x-ray equipment and setting controls Skill in preparing patient for exam
Technical	Ability to recognize adverse medical reactions Ability to respond to medical emergencies Knowledge of basic physics (concepts of energy, electric power/circuits, properties of x-rays) Knowledge of basic sciences (chemistry, biology) Knowledge of cross-sectional anatomy Knowledge of sterile technique Computer programming skills Skill in patient care procedures/nursing Skills with software programs
Interpersonal/Communicative	Skill in explaining procedure to patient
Administrative/Organizational	Knowledge of the care/maintenance of patients' medical equipment/support systems

Table A.8c
Diagnostic Radiologic Technologist:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance
	Somewhat More Important
Procedural	Ability to apply radiographic exposure techniques
	Ability to develop image
	Ability to prepare contrast mediums
	Knowledge of patient transfer and positioning
	Skill in administering contrast mediums to patients
	Skill in recognizing abnormalities and artifacts within the recorded image
	Skill in shielding patient organs
Technical	Ability to apply basic mathematics
	Ability to apply statistics
	Ability to recognize correct and appropriate physician order/specifications
	Ability to understand and interpret medical terminology
	Knowledge of functional systems (ex: digestive, cardiovascular)
	Knowledge of human anatomy
	Knowledge of pathology/disease progression
	Knowledge of physiology
	Knowledge of radiation protection standards and practices
	Knowledge of radiobiology
	Knowledge of radiopharmacology
Interpersonal/Communicative	Skill in communicating with physician
	Ability to work independently and exercise judgment
	Ability to assess patient condition throughout procedure (observation & communication skills)
	Ability to work as a team member with other imaging professionals
	Skill in relieving patient anxiety
	Ability to supervise other staff
Administrative/Organizational	Ability to interpret physician's orders
	Ability to prepare written reports
	Skill in keeping detailed records of patients, films, supplies, etc.

Table A.8d
Diagnostic Radiologic Technologist:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **Not More Important**
Procedural	Ability to properly record images Skill in manipulation of beam
Technical	Ability to apply algebra Ability to apply calculus Ability to apply geometry
Interpersonal/Communicative	None
Administrative/Organizational	Ability to maintain equipment (upkeep, simple repair, recognition of malfunctions) Ability to perform purchasing tasks (of supplies, etc.) Skill in loading film/changing chemicals

Table A.9a
Diagnostic Radiologic Technologist:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Very Important**
Procedural	Ability to prepare contrast mediums Ability to recognize need for additional images Skill in administering contrast mediums to patients Skill in evaluating images for technical quality Skill in positioning x-ray equipment and setting controls Skill in recognizing abnormalities and artifacts within the recorded image

Table A.9a (continued)
Diagnostic Radiologic Technologist:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement
	Very Important
Technical	Ability to recognize correct and appropriate physician order/specifications
	Ability to recognize adverse medical reactions
	Ability to understand and interpret medical terminology
	Keyboard skills
	Knowledge of basic physics (concepts of energy, electric power/circuits, properties of x-rays)
	Knowledge of cross-sectional anatomy
	Knowledge of functional systems (ex: digestive, cardiovascular)
	Knowledge of human anatomy
	Knowledge of medical ethics
	Knowledge of pathology/disease progression
	Knowledge of radiobiology
	Knowledge of radiopharmacology
	Knowledge of sterile technique
	Skill in patient care procedures/nursing skills
Interpersonal/Communicative	Skill in explaining procedure to patient
	Skill in communicating with physician
	Ability to work independently and exercise judgment
	Ability to assess patient condition throughout procedure (observation & communication skills)
	Ability to work as a team member with other imaging professionals
	Skill in relieving patient anxiety
	Ability to supervise other staff
Administrative/Organizational	Skill in loading film/changing chemicals
	Ability to maintain equipment (upkeep, simple repair, recognition of malfunctions)
	Knowledge of the care/maintenance of patients' medical equipment/support systems
	Skill in keeping detailed records of patients, films, supplies, etc.
	Ability to perform purchasing tasks (of supplies, etc.)
	Ability to prepare written reports

Table A.9b
Diagnostic Radiologic Technologist: Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement
	Moderately Important
Procedural	Ability to apply radiographic exposure techniques Ability to assist in cardiovascular studies Ability to assist in flouroscopy studies Ability to develop image Knowledge of patient transfer and positioning Skill in manipulation of beam Skill in preparing patient for exam Skill in shielding patient organs
Technical	Ability to apply basic mathematics Ability to apply statistics Ability to respond to medical emergencies Knowledge of basic sciences (chemistry, biology) Knowledge of physiology Computer programming skills Skills with software programs
Interpersonal/Communicative	None
Administrative/Organizational	Ability to interpret physician's orders

Table A.9c
Diagnostic Radiologic Technologist:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Somewhat Important**
Procedural	None
Technical	Ability to apply algebra Ability to apply calculus Ability to apply geometry Knowledge of radiation protection standards and practices
Interpersonal/Communicative	None
Administrative/Organizational	None

Table A.9d
Diagnostic Radiologic Technologist:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Not Important**
Procedural	Ability to properly record images
Technical	None
Interpersonal/Communicative	None
Administrative/Organizational	None

Table A.10a
Radiation Therapy Technologist:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Very Important**
Procedural	Ability to advise patients on proper diet and skin care procedures Ability to evaluate images for technical quality Ability to interpret previous diagnostic test results Ability to measure patient's body contours Knowledge of patient transfer and positioning Skill in administering radiation therapy treatments accurately Skill in image development Skill in maintaining detailed records of therapy sessions Skill in positioning equipment and setting controls Skill in preparing patient for exam
Technical	Ability to apply algebra Ability to apply basic math skills Ability to apply geometry Ability to operate a variety of sophisticated machines Ability to understand and translate medical terminology Knowledge of basic clinical dosimetry Knowledge of cancer physiology Knowledge of nutrition and effects of radiation on digestion Knowledge of clinical and technical radiation oncology Knowledge of human anatomy Knowledge of medical ethics Knowledge of physical & biological sciences Knowledge of physiology Knowledge of practical psychology Knowledge of radiotherapy, radiobiology, radiation physics Knowledge of relevant laws and regulations Ability to respond to medical emergencies Ability to apply radiation safety procedures Knowledge of fluoroscopy

Table A.10a (continued)
Radiation Therapy Technologist:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Very Important**
Interpersonal/Communicative	Ability to assess patient condition throughout procedure (via monitors, verbal and nonverbal signs) Ability to recognize adverse reactions Ability to recognize correct and appropriate physician order/specifications Ability to work as a team member with other imaging professionals Problem-solving skills Skill in communicating with nursing and support staff Skill in communicating with physician Skill in explaining procedure to patient Skill in expressing empathy/relating to patients Skill in patient care procedures/nursing skills Skill in relieving patient anxiety
Administrative/Organizational	Ability to do detailed work Ability to interpret physician's orders Ability to monitor patient response to radiation and refer back to physician instead of continuing treatments, when indicated Ability to read patient charts and identify necessary preliminary information Skill in keeping detailed records of patients, films, supplies

Table A.10b
Radiation Therapy Technologist:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Moderately Important**
Procedural	Ability to analyze equipment during treatment to ensure delivery of proper dosage Ability to cut blocks Ability to manufacture molds and beam directional shells Ability to set up machines and diagnose problems with equipment
Technical	Ability to apply calculus Ability to apply statistics Knowledge of histology Knowledge of pathology/disease progression
Interpersonal/Communicative	Ability to counsel patient on diet and hygiene Ability to refer patients to other available services Skill in suggesting modifications to treatment plans
Administrative/Organizational	Ability to care for patient's medical equipment/support systems Ability to maintain equipment (upkeep, simple repair, recognition of malfunctions)

Table A.10c
Radiation Therapy Technologist:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Somewhat Important**
Procedural	Ability to conduct particle beam therapy Ability to prepare interstitial and intracavity sources Ability to read MRI or CT scans Ability to visualize treatment plans in three dimensions Knowledge of machinery and molding process Skill in taking blood counts, weight, and vital signs
Technical	Ability to input data into a computer Ability to understand computer modeling and simulation Knowledge of cross-sectional anatomy Knowledge of software programs Knowledge of hypothermia treatment techniques
Administrative/Organizational	Ability to prepare written reports

Table A.10d
Radiation Therapy Technologist:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Not Important**
Procedural	Ability to recognize need for additional images
Technical	Ability to write computer programs
Interpersonal/Communicative	None
Administrative/Organizational	None

Table A.11a
Radiation Therapy Technologist:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **Much More Important**
Procedural	None
Technical	None
Interpersonal/Communicative	None
Administrative/Organizational	None

Table A.11b
Radiation Therapy Technologist:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **More Important**
Procedural	Ability to analyze equipment during treatment to ensure delivery of proper dosage Ability to conduct particle beam therapy Ability to evaluate images for technical quality Ability to interpret previous diagnostic test results Ability to set up machines and diagnose problems with equipment Ability to visualize treatment plans in three dimensions Skill in administering radiation therapy treatments accurately Skill in image development Skill in maintaining detailed records of therapy sessions Skill in positioning equipment and setting controls Ability to read MRI or CT scans

Table A.11b (continued)
Radiation Therapy Technologist:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance
	More Important
Technical	Ability to input data into a computer
	Ability to operate a variety of sophisticated machines
	Ability to understand computer modeling and simulation
	Knowledge of clinical and technical radiation oncology
	Knowledge of radiotherapy, radiobiology, radiation physics
	Knowledge of software programs
	Knowledge of fluoroscopy
Interpersonal/Communicative	Skill in communicating with physician
	Skill in explaining procedure to patient
Administrative/Organizational	Ability to read patient charts and identify necessary preliminary information

Table A.11c
Radiation Therapy Technologist:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance
	Somewhat More Important
Procedural	Ability to advise patients on proper diet and skin care procedures
	Ability to cut blocks
	Ability to manufacture molds and beam directional shells
	Ability to prepare interstitial and intracavity sources
	Knowledge of machinery and molding process
	Knowledge of patient transfer and positioning
	Skill in preparing patient for exam

Table A.11c (continued)
Radiation Therapy Technologist:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **Somewhat More Important**
Technical	Ability to apply algebra
	Ability to apply statistics
	Ability to write computer programs
	Knowledge of basic clinical dosimetry
	Knowledge of cancer physiology
	Knowledge of cross-sectional anatomy
	Knowledge of histology
	Knowledge of pathology/disease progression
	Knowledge of physical & biological sciences
	Knowledge of practical psychology
	Knowledge of relevant laws and regulations
	Ability to apply radiation safety procedures
	Ability to respond to medical emergencies
	Knowledge of hypothermia treatment techniques
Interpersonal/Communicative	Ability to assess patient condition throughout procedure (via monitors, verbal and nonverbal signs)
	Ability to recognize adverse reactions
	Ability to recognize correct and appropriate physician order/specifications
	Ability to refer patients to other available services
	Ability to work as a team member with other imaging professionals
	Problem-solving skills
	Skill in communicating with nursing and support staff
	Skill in patient care procedures/nursing skills
	Skill in relieving patient anxiety
	Skill in suggesting modifications to treatment plans
Administrative/Organizational	Ability to interpret physician's orders
	Ability to maintain equipment (upkeep, simple repair, recognition of malfunctions)
	Ability to care for patient's medical equipment/support systems
	Skill in keeping detailed records of patients, films, supplies, etc.
	Ability to prepare written reports
	Ability to do detailed work
	Ability to monitor patient response to radiation and refer back to physician instead of continuing treatments, when indicated

Table A.11d
Radiation Therapy Technologist: Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **Not Important**
Procedural	Ability to measure patient's body contours
	Ability to recognize need for additional images
	Skill in taking blood counts, weight, and vital signs
Technical	Ability to apply basic math skills
	Ability to apply calculus
	Ability to apply geometry
	Ability to understand and translate medical terminology
	Knowledge of human anatomy
	Knowledge of medical ethics
	Knowledge of nutrition and effects of radiation on digestion
	Knowledge of physiology
Interpersonal/Communicative	Ability to counsel patient on diet and hygiene
	Skill in expressing empathy/relating to patients
Administrative/Organizational	None

Table A.12a
Radiation Therapy Technologist: Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement
	Very Important
Procedural	Ability to advise patients on proper diet and skin care procedures
	Ability to cut blocks
	Ability to evaluate images for technical quality
	Ability to interpret previous diagnostic test results
	Ability to manufacture molds and beam directional shells
	Ability to read MRI or CT scans
	Ability to set up machines and diagnose problems with equipment
	Knowledge of machinery and molding process
	Skill in positioning equipment and setting controls
	Skill in preparing patient for exam
	Skill in taking blood counts, weight, and vital signs
Technical	Ability to apply algebra
	Ability to apply calculus
	Ability to apply geometry
	Ability to operate a variety of sophisticated machines
	Ability to understand and translate medical terminology
	Ability to understand computer modeling and simulation
	Ability to write computer programs
	Knowledge of basic clinical dosimetry
	Knowledge of cancer physiology
	Knowledge of clinical and technical radiation oncology
	Knowledge of cross-sectional anatomy
	Knowledge of histology
	Knowledge of medical ethics
	Knowledge of pathology/disease progression
	Knowledge of physiology
	Knowledge of practical psychology
	Knowledge of radiotherapy, radiobiology, radiation physics
	Knowledge of relevant laws and regulations
	Knowledge of software programs
	Knowledge of fluoroscopy

Table A.12a (continued)
Radiation Therapy Technologist:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Very Important**
Interpersonal/Communicative	Ability to assess patient condition throughout procedure (via monitors, verbal and nonverbal signs) Ability to recognize adverse reactions Ability to refer patients to other available services Skill in communicating with nursing and support staff Skill in communicating with physician Skill in explaining procedure to patient Skill in relieving patient anxiety Skill in suggesting modifications to treatment plans
Administrative/Organizational	Ability to interpret physician's orders Ability to prepare written reports Ability to read patient charts and identify necessary preliminary information

Table A.12b
Radiation Therapy Technologist:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement
	Moderately Important
Procedural	Ability to conduct particle beam therapy
	Ability to prepare interstitial and intracavity sources
	Ability to recognize need for additional images
	Ability to visualize treatment plans in three dimensions
	Knowledge of patient transfer and positioning
	Skill in administering radiation therapy treatments accurately
Technical	Ability to apply statistics
	Ability to input data into a computer
	Knowledge of human anatomy
	Knowledge of nutrition and effects of radiation on digestion
	Ability to apply radiation safety procedures
	Ability to respond to medical emergencies
Interpersonal/Communicative	Ability to counsel patient on diet and hygiene
	Ability to recognize correct and appropriate physician order/specifications
	Ability to work as a team member with other imaging professionals
	Problem-solving skills
	Skill in expressing empathy/relating to patients
	Skill in patient care procedures/nursing skills
Administrative/Organizational	Ability to care for patient's medical equipment/support systems
	Ability to do detailed work
	Ability to maintain equipment (upkeep, simple repair, recognition of malfunctions)
	Ability to monitor patient response to radiation and refer back to physician instead of continuing treatments, when indicated
	Skill in keeping detailed records of patients, films, supplies, etc.

Table A.12c
Radiation Therapy Technologist: Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Somewhat Important**
Procedural	Ability to analyze equipment during treatment to ensure delivery of proper dosage Ability to measure patient's body contours Skill in image development Skill in maintaining detailed records of therapy sessions
Technical	Ability to apply basic math skills Knowledge of physical & biological sciences Knowledge of hypothermia treatment techniques
Administrative/Organizational	None

Table A.12d
Radiation Therapy Technologist: Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Not Important**
Procedural	None
Technical	None
Interpersonal/Communicative	None
Administrative/Organizational	None

Table A.13a
Diagnostic Ultrasound Technologist: Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry
	Very Important
Procedural	Skill in preparing patient for exam Skill in interpreting medical history for testing implications Ability to place gels and transducers on patient properly Skill in selecting proper equipment and setting controls Knowledge of correlating technologies (i.e., treadmills, CT, MRI, angiograms) Ability to operate video equipment Ability to evaluate images for technical quality Ability to measure dimensions from images Ability to recognize need for additional images Ability to use ancillary devices (such as selective transducers, oscilloscope and camera) Ability to conduct abdominal sonography Ability to conduct obstetrical & gynecology sonography
Technical	Ability to understand and interpret medical terminology Knowledge of skeletal structure Knowledge of anatomy and physiology abdominal anatomy and physiology cardiac anatomy and physiology vascular anatomy and physiology cross-sectional anatomy Knowledge of pathology/disease progression Knowledge of obstetrics, fetal development Knowledge of gynecological disease Knowledge of Doppler techniques Doppler physics Doppler signal processing application of Doppler techniques Ability to perform spectral or waveform Doppler Ability to perform Duplex imaging

Table A.13a (continued)
Diagnostic Ultrasound Technologist:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Very Important**
Technical	Computer skills: ability to input data knowledge of software programs ability to understand computer simulation Knowledge of the applications and limitations of ultrasound technology of related diagnostic procedures Ability to recognize adverse medical reactions Ability to respond to medical emergencies Skill in patient care procedures/nursing skills Ability to recognize correct and appropriate physician order/specifications Ability to make preliminary diagnosis and report information to a physician
Interpersonal/Communicative	Skill in explaining procedure to patient Skill in communicating with physician Skill in communicating with nursing and support staff Ability to assess patient condition throughout procedure (observation & communication) Ability to work as a team member with other professionals Ability to work independently and exercise judgement Skill in relieving patient anxiety Ability to supervise other staff
Administrative/Organizational	Knowledge of the care/maintenance of patient's medical equipment/support systems Ability to interpret physician's orders Ability to do detailed work

Table A.13b
Diagnostic Ultrasound Technologist:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry
	Moderately Important
Procedural	Ability to perform calibrations to adjust equipment Ability to conduct adult echocardiography sonography superficial parts sonography peripheral vascular sonography vascular sonography
Technical	Knowledge of applied basic sciences (chemistry, biology) Ability to apply mathematical concepts basic mathematics geometry Knowledge of operating room techniques Ability to perform echocardiograms Ability to take blood pressure/segmental pressure
Interpersonal/Communicative	None
Administrative/Organizational	Ability to maintain equipment(upkeep, simple repair, recognition of malfunctions) Ability to keep detailed records of patients, films, supplies, etc. Ability to prepare written reports Knowledge of medical records systems

Table A.13c
Diagnostic Ultrasound Technologist:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Somewhat Important**
Procedure	Ability to assist in radiation therapy treatment planning Ability to conduct neurosonography
Technical	Ability to apply basic mathematic concepts algebra calculus
Interpersonal/Communicative	Ability to supervise other staff
Administrative/Organizational	None

Table A.13d
Diagnostic Ultrasound Technologist:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Not Important**
Procedural	Skill in recording image in a freeze-frame or stripchart mode Ability to conduct ophthalmology sonography
Technical	Ability to conduct blood tests
Interpersonal/Communicative	None
Administrative/Organizational	None

Table A.14a
Diagnostic Ultrasound Technologist:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **Much More Important**
Procedural	Ability to conduct peripheral vascular sonography Ability to conduct superficial parts sonography Ability to conduct vascular sonography
Technical	Ability to make preliminary diagnosis and report information to a physician Ability to perform Duplex imaging Ability to understand computer simulation Knowledge of abdominal anatomy and physiology Knowledge of ability to perform spectral or waveform Doppler Knowledge of application of Doppler techniques Knowledge of cardiac anatomy and physiology Knowledge of Doppler physics Knowledge of Doppler signal processing Knowledge of gynecological disease Knowledge of obstetrics, fetal development Knowledge of pathology/disease progression Knowledge of the applications and limitations of related diagnostic procedures Knowledge of the applications and limitations of ultrasound technology Knowledge of vascular anatomy and physiology
Interpersonal/Communicative	None
Administrative/Organizational	None

Table A.14b
Diagnostic Ultrasound Technologist:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance
	More Important
Procedural	Ability to conduct abdominal sonography
	Ability to conduct adult echocardiography sonography
	Ability to conduct neurosonography
	Ability to conduct obstetrical & gynecology sonography
	Ability to evaluate images for technical quality
	Ability to measure dimensions from images
	Ability to operate video equipment
	Ability to perform calibrations to adjust equipment
	Ability to recognize need for additional images
	Ability to use ancillary devices (such as selective transducers, oscilloscope and camera)
	Knowledge of correlating technologies (i.e. treadmills, CT, MRI, angiograms)
	Skill in interpreting medical history for testing implications
	Skill in selecting proper equipment and setting controls
Technical	Ability to input data
	Ability to perform echocardiograms
	Ability to recognize adverse medical reactions
	Ability to respond to medical emergencies
	Ability to understand and interpret medical terminology
	Knowledge of anatomy and physiology
	Knowledge of cross-sectional anatomy
	Knowledge of operating room techniques
	Knowledge of software programs
	Knowledge of skeletal structure
Interpersonal/Communicative	Ability to assess patient condition throughout procedure (observation & communication)
	Ability to do detailed work
	Ability to supervise other staff
	Ability to work as a team member with other professionals
	Ability to work independently and exercise judgment
	Skill in communicating with nursing and support staff
	Skill in communicating with physician
	Skill in explaining procedure to patient

Table A.14b (continued)
Diagnostic Ultrasound Technologist:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **More Important**
Administrative/Organizational	Ability to interpret physician's orders Ability to maintain equipment (upkeep, simple repair, recognition of malfunctions) Knowledge of the care/maintenance of patients' medical equipment/support systems Ability to keep detailed records of patients, films, supplies, etc. Ability to prepare written reports Knowledge of medical records systems

Table A.14c
Diagnostic Ultrasound Technologist:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **Somewhat More Important**
Procedural	Ability to conduct pediatric echocardiography sonography Ability to place gels and transducers on patient properly Skill in preparing patient for exam
Technical	Ability to apply basic mathematics Ability to recognize correct and appropriate physician order/specification Ability to take blood pressure/segmental pressures Knowledge of applied basic sciences (chemistry, biology) Skill in patient care procedures/nursing skills
Interpersonal/Communicative	Skill in relieving patient anxiety
Administrative/Organizational	None

Table A.14d
Diagnostic Ultrasound Technologist: Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **Not More Important**
Procedural	Ability to assist in radiation therapy treatment planning Ability to conduct ophthalmology sonography Skill in recording image in a freeze-frame or stripchart mode
Technical	Ability to apply algebra Ability to apply calculus Ability to apply geometry Ability to conduct blood tests
Interpersonal/Communicative	None
Administrative/Organizational	None

Table A.15a
Diagnostic Ultrasound Technologist: Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Very Important**
Procedural	Ability to conduct abdominal sonography Ability to conduct obstetrical & gynecology sonography Ability to conduct peripheral vascular sonography Ability to conduct superficial parts sonography Ability to conduct vascular sonography Ability to evaluate images for technical quality Ability to measure dimensions from images Ability to perform calibrations to adjust equipment Ability to recognize need for additional images Ability to use ancillary devices (such as selective transducers, oscilloscope and camera) Knowledge of correlating technologies (i.e. treadmills, CT, MRI, angiograms) Skill in interpreting medical history for testing implications Skill in selecting proper equipment and setting controls

Table A.15a (continued)
Diagnostic Ultrasound Technologist:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement
	Very Important
Technical	Ability to apply basic mathematics
	Ability to input data
	Ability to make preliminary diagnosis and report information to a physician
	Ability to perform Duplex imaging
	Ability to perform echocardiograms
	Ability to recognize adverse medical reactions
	Ability to recognize correct and appropriate physician order/specification
	Ability to respond to medical emergencies
	Ability to take blood pressure/segmental pressures
	Ability to understand and interpret medical terminology
	Ability to understand computer simulation
	Knowledge of abdominal anatomy and physiology
	Knowledge of ability to perform spectral or waveform Doppler
	Knowledge of application of Doppler techniques
	Knowledge of applied basic sciences (chemistry, biology)
	Knowledge of cardiac anatomy and physiology
	Knowledge of cross-sectional anatomy
	Knowledge of Doppler physics
	Knowledge of Doppler signal processing
	Knowledge of gynecological disease
	Knowledge of obstetrics, fetal development
	Knowledge of operating room techniques
	Knowledge of pathology/disease progression
	Knowledge of the applications and limitations of related diagnostic procedures
	Knowledge of software programs
	Knowledge of the applications and limitations of ultrasound technology
	Knowledge of vascular anatomy and physiology
	Skill in patient care procedures/nursing skills
	Knowledge of skeletal structure
Interpersonal/Communicative	Skill in explaining procedure to patient
	Skill in communicating with physician
	Skill in communicating with nursing and support staff
	Ability to assess patient condition throughout procedure (observation & communication)

Table A.15a (continued)
Diagnostic Ultrasound Technologist:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Very Important**
Interpersonal/Communicative	Ability to work as a team member with other professionals Ability to work independently and exercise judgement Skill in relieving patient anxiety Ability to do detailed work Ability to supervise other staff
Administrative/Organizational	Ability to interpret physician's orders Ability to maintain equipment (upkeep, simple repair, recognition of malfunctions) Knowledge of the care/maintenance of patients' medical equipment/support systems Ability to keep detailed records of patients, films, supplies etc. Ability to prepare written reports Knowledge of medical records systems

Table A.15b
Diagnostic Ultrasound Technologist:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Moderately Important**
Procedural	Ability to conduct adult echocardiography sonography Ability to conduct pediatric echocardiography sonography Ability to operate video equipment Ability to place gels and transducers on patient properly Skill in preparing patient for exam
Technical	Ability to apply algebra Ability to apply calculus Ability to apply geometry
Interpersonal/Communicative	None
Administrative/Organizational	None

Table A.15c
Diagnostic Ultrasound Technologist:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Somewhat Important**
Procedural	Ability to assist in radiation therapy treatment planning Ability to conduct neurosonography
Technical	Ability to conduct blood tests
Interpersonal/Communicative	None
Administrative/Organizational	None

Table A.15d
Diagnostic Ultrasound Technologist:
Skills, Knowledge, and Abilities Important for Important Job Advancement

SKA Category	Level of Importance for Job Advancement **Not Important**
Procedural	Ability to conduct ophthalmology sonography Skill in recording image in a freeze-frame or stripchart mode
Technical	None
Interpersonal/Communicative	None
Administrative/Organizational	None

Table A.16a
Magnetic Resonance Imaging Technologist: Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry
	Very Important
Procedural	Ability to prepare patient for exam
	Skill in interpreting medical history for imaging implications
	Knowledge of patient transfer and positioning
	Skill in MRI equipment set-up and setting controls
	Ability to prepare contrast media
	Skill in taking/developing image
	Skill in evaluating images for technical quality
	Ability to recognize need for additional images
Technical	Ability to apply basic mathematics
	Ability to comprehend the mechanics, limitations, and applications of MRI technology
	Ability to input data into a computer
	Ability to recognize adverse medical reactions
	Ability to recognize correct and appropriate physician order/specifications
	Ability to respond to medical emergencies
	Ability to understand and interpret medical terminology
	Knowledge of basic sciences (chemistry, biology)
	Knowledge of cross-sectional anatomy
	Knowledge of human anatomy
	Knowledge of physics (properties of magnetism, radio waves)
	Knowledge of physiology
	Knowledge of the characteristics of normal and abnormal tissue
	Skill in patient care procedures/nursing skills
	Visualization skills
Interpersonal/Communicative	Skill in explaining procedure to patient
	Ability to work with family members who support patient
	Skill in communicating with physician
	Ability to assess patient condition throughout procedure (observation & communication skills)
	Ability to recognize and handle adverse psychological reactions (including claustrophobic reactions)
	Ability to work as a team member with other imaging professionals

Table A.16a (continued)
Magnetic Resonance Imaging Technologist: Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Very Important**
Interpersonal/Communicative	Skill in communicating with nursing and support staff Skill in relieving patient anxiety Ability to work independently and exercise independent judgement
Administrative/Organizational	Ability to interpret physician's orders Ability to ask questions on incomplete order to obtain more complete study Skill in keeping detailed records of patients, films, supplies Ability to maintain equipment (upkeep, simple repair, recognition of malfunctions) Knowledge of the care/maintenance of patients' medical equipment/support systems Ability to prepare written reports

Table A.16b
Magnetic Resonance Imaging Technologist: Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Moderately Important**
Procedural	Ability to interpret basic brain scan findings
Technical	Ability to apply algebra Ability to change formulas within computer procedures Knowledge of functional systems (ex: digestive, cardiovascular) Knowledge of pathology/disease progression Knowledge of software programs Knowledge of x-ray technology and procedures
Interpersonal/Communicative	None
Administrative/Organizational	None

Table A.16c
Magnetic Resonance Imaging Technologist: Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Somewhat Important**
Procedural	Ability to conduct MR spectroscopy (chemical analysis)
Technical	None
Interpersonal/Communicative	Ability to supervise other staff
Administrative/Organizational	None

Table A.16d
Magnetic Resonance Imaging Technologist: Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Not Important**
Procedural	Ability to insert IV
Technical	Ability to apply calculus
Interpersonal/Communicative	None
Administrative/Organizational	None

Table A.17a
Magnetic Resonance Imaging Technologist: Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **Much More Important**
Procedural	None
Technical	None
Interpersonal/Communicative	None
Administrative/Organizational	None

Table A.17b
Magnetic Resonance Imaging Technologist: Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance
	More Important
Procedural	Ability to prepare patient for exam
	Skill in interpreting medical history for imaging implications
	Skill in MRI equipment set-up and setting controls
	Ability to prepare contrast media
	Skill in taking/developing image
	Ability to interpret basic scan findings
	Skill in evaluating images for technical quality
	Ability to recognize need for additional images
Technical	Ability to comprehend the mechanics, limitations, and applications of MRI technology
	Ability to input data into a computer
	Ability to respond to medical emergencies
	Ability to understand and interpret medical terminology
	Knowledge of cross-sectional anatomy
	Knowledge of physics (properties of magnetism, radio waves)
	Knowledge of software programs
	Knowledge of the characteristics of normal and abnormal tissue
Interpersonal/Communicative	Ability to assess patient condition throughout procedure (observation & communication skills)
	Ability to recognize and handle adverse psychological reactions (including claustrophobic reactions)
	Ability to supervise other staff
	Ability to work as a team member with other imaging professionals
	Ability to work independently and exercise independent judgement
	Ability to work with family members who support patient
	Skill in communicating with physician
	Skill in explaining procedure to patient
	Skill in relieving patient anxiety
Administrative/Organizational	Ability to maintain equipment (upkeep, simple repair, recognition of malfunctions)

Table A.17c
Magnetic Resonance Imaging Technologist
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance
	Somewhat More Important
Procedural	Knowledge of patient transfer and positioning
Technical	Ability to apply algebra
	Ability to apply basic mathematics
	Ability to apply geometry
	Ability to change formulas within computer procedures
	Ability to recognize adverse medical reactions
	Ability to recognize correct and appropriate physician order/specifications
	Knowledge of basic sciences (chemistry, biology)
	Knowledge of functional systems (ex: digestive, cardiovascular)
	Knowledge of human anatomy
	Knowledge of pathology/disease progression
	Knowledge of physiology
	Knowledge of x-ray technology and procedures
	Skill in patient care procedures/nursing skills
	Visualization skills
Interpersonal/Communicative	Skill in communicating with nursing and support staff
Administrative/Organizational	Ability to interpret physician's orders
	Ability to ask questions on incomplete order to obtain more complete study
	Skill in keeping detailed records of patients, films, supplies, etc.
	Knowledge of the care/maintenance of patients' medical equipment/support systems
	Ability to prepare written reports

Table A.17d
Magnetic Resonance Imaging Technologist: Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **Not More Important**
Procedural	Ability to conduct MR spectroscopy (chemical analysis) Ability to insert IV
Technical	Ability to apply calculus
Interpersonal/Communicative	None
Administrative/Organizational	None

Table A.18a
Magnetic Resonance Imaging Technologist:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Very Important**
Procedural	Ability to prepare patient for exam
	Skill in interpreting medical history for imaging implications
	Knowledge of patient transfer and positioning
	Skill in MRI equipment set-up and setting controls
	Ability to prepare contrast media
	Skill in taking/developing image
	Ability to interpret basic brain scan findings
	Skill in evaluating images for technical quality
	Ability to recognize need for additional images
Technical	Ability to apply basic mathematics
	Ability to change formulas within computer procedures
	Ability to comprehend the mechanics, limitations, and applications of MRI technology
	Ability to input data into a computer
	Ability to recognize adverse medical reactions
	Ability to recognize correct and appropriate physician order/specifications
	Ability to respond to medical emergencies
	Ability to understand and interpret medical terminology
	Knowledge of basic sciences (chemistry, biology)
	Knowledge of cross-sectional anatomy
	Knowledge of functional systems (ex: digestive, cardiovascular)
	Knowledge of human anatomy
	Knowledge of pathology/disease progression
	Knowledge of physics (properties of magnetism, radio waves)
	Knowledge of physiology
	Knowledge of software programs
	Knowledge of the characteristics of normal and abnormal tissue
	Skill in patient care procedures/nursing skills
	Visualization skills

Table A.18a (continued)
Magnetic Resonance Imaging Technologist: Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement
	Very Important
Interpersonal/Communicative	Skill in explaining procedure to patient Ability to work with family members who support patient Skill in communicating with physician Ability to assess patient condition throughout procedure (observation & communication skills) Ability to recognize and handle adverse psychological reactions (including claustrophobic reactions) Ability to work as a team member with other imaging professionals Skill in communicating with nursing and support staff Skill in relieving patient anxiety Ability to work independently and exercise independent judgement Ability to supervise other staff
Administrative/Organizational	Ability to interpret physician's orders Ability to ask questions on incomplete order to obtain more complete study Skill in keeping detailed records of patients, films, supplies, etc. Ability to maintain equipment (upkeep, simple repair, recognition of malfunctions) Knowledge of the care/maintenance of patients' medical equipment/support systems Ability to prepare written reports

Table A.18b
Magnetic Resonance Imaging Technologist: Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Moderately Important**
Procedural	None
Technical	Ability to apply algebra Ability to apply geometry Knowledge of x-ray technology and procedures
Interpersonal/Communicative	None
Administrative/Organizational	None

Table A.18c
Magnetic Resonance Imaging Technologist: Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Somewhat Important**
Procedural	None
Technical	Ability to apply calculus
Interpersonal/Communicative	None
Administrative/Organizational	None

Table A.18d
Magnetic Resonance Imaging Technologist: Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Not Important**
Procedural	Ability to conduct MR spectroscopy (chemical analysis) Ability to insert IV
Technical	None
Interpersonal/Communicative	None
Administrative/Organizational	None

APPENDIX B
Medical Therapy Occupations Tables

Table B.1a
Respiratory Therapist:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry
	Very Important
Assessment and Diagnosis	Ability to assess patients' condition based on exam and tests Ability to interpret implications of vital signs for treatment Ability to read and interpret heart and respiratory monitors Ability to read and interpret reports on patients from prior shifts of RTs Knowledge of normal blood gas content and pH Skill in monitoring the patient's heart rate, breath sounds, and general appearance Ability to assess when a physician needs to be called Ability to conduct cardiac treadmill tests Ability to conduct EKG Ability to determine if physicians orders are appropriate Ability to determine when to take patient off respirator Ability to apply anatomy and physiology to assess patient condition
Treatment	Ability to administer aerosol drugs Ability to conduct procedure to wean patients from respirators Ability to determine the most appropriate ventilator for a patient Ability to fill physician's orders for treatment Ability to function as a hemodynamic assistant Ability to assist with cardiac catheterization Ability to use digitalized ventilators Ability to use pressure support ventilator Ability to ventilate the patient with a manual resuscitator bag Ability to work general hospital floor Ability to work in critical care Ability to work in the emergency room Knowledge of hospital respiratory care routines and procedures

Table B.1a (continued)
Respiratory Therapist:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry
	Very Important
Treatment	Knowledge of how to operate different ventilators Knowledge of how to set oxygen flow rates Knowledge of how ventilators assist patients breathing Knowledge of set inspiratory and expiratory rates Knowledge of what effect ventilators should have on the patient Ability to identify potential drug interactions with adverse responses before administering drugs Skill in administering oxygen therapy (masks) Skill in assisting with bronchoscopy Skill in bronchodilator therapy Skill in equipment set up and maintenance Skill in pediatric intensive care Skill in physiotherapy Skill in postural draining Skill in pulmonary rehabilitation Skill in responding to cardiac arrest with resuscitation equipment Skill in suctioning patients Skill in using a nebulizer
General Knowledge	Knowledge of blood chemistry Knowledge of cardiopulmonary anatomy Knowledge of chemistry Knowledge of how patients respond to life support Knowledge of human anatomy Knowledge of human physiology Knowledge of microbiology Knowledge of pathology Knowledge of pharmacology Knowledge of physics Knowledge of pulmonary disease Knowledge of respiratory physiology and anatomy
Administrative and Communication	Ability to accurately record treatments and patient's condition Ability to be assertive with physicians and nurses Ability to be patient during difficult and lengthy procedures

Table B.1a (continued)
Respiratory Therapist:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Very Important**
Administrative and Communication	Ability to communicate with other therapists Ability to communicate with patients who cannot speak Ability to describe treatments to patients Ability to develop relationships with patients Ability to make quick decisions during crises Ability to organize time efficiently and keep to schedules Ability to pay attention to detail in monitoring patients Knowledge of medical terminology Ability to describe a patient's condition to the physician

Table B.1b
Respiratory Therapist:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Moderately Important**
Assessment and Diagnosis	Ability to conduct blood gas analysis Ability to conduct pulmonary screening exams
Treatment	Ability to administer respiratory care during patient transport Skill in high frequency jet ventilation Skill in Intermittent Positive Pressure Breathing Skill in nasal ventilation Skill in neonatal intensive care
General Knowledge	Ability to conduct algebraic calculations on hand calculators Skills in computer utilization

Table B.1b (continued)
Respiratory Therapist:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Moderately Important**
Administrative and Communication	Ability to write in prose (such as memos and reports) Knowledge of hospital record keeping procedures

Table B.1c
Respiratory Therapist:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Somewhat Important**
Assessment and Diagnosis	Ability to calibrate blood gas analyzer machines
Treatment	Skill in intubation Ability to work in surgery Ability to work in home care setting
General Knowledge	Knowledge of statistics and statistical analysis Skills in computer programming
Administrative and Communication	Ability to supervise other staff Knowledge of third-party payer rules for reimbursement and keeping records

Table B.1d
Respiratory Therapist:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Not Important**
Assessment and Diagnosis	Ability to take arterial blood samples
Treatment	Ability to conduct echocardiograms
General Knowledge	None
Administrative and Communication	None

Table B.2a
Respiratory Therapist:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **Much More Important**
Assessment and Diagnosis	Ability to determine if physician's orders are appropriate
Treatment	Ability to assist with cardiac catheterization Ability to use digitalized ventilators Ability to use pressure support ventilator Knowledge of how to operate different ventilators
General Knowledge	Skills in computer utilization
Administrative and Communication	None

Table B.2b
Respiratory Therapist:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance
	More Important
Assessment and Diagnosis	Ability to assess patient's condition based on exam and tests Ability to conduct blood gas analysis Ability to read and interpret heart and respiratory monitors
Treatment	Ability to administer aerosol drugs Ability to administer respiratory care during patient transport Ability to conduct procedure to wean patients from respirators Ability to describe a patient's condition to the physician Ability to determine the most appropriate ventilator for a patient Ability to determine when to take patient off respirator Ability to function as a hemodynamic assistant Ability to identify potential drug interactions with adverse responses before administering drugs Ability to work in critical care Ability to work in home care setting Knowledge of what effect ventilators should have on the patient Knowledge of how ventilators assist patients' breathing Knowledge of set inspiratory and expiratory rates Skill in bronchodilator therapy Skill in equipment set up and maintenance Skill in nasal ventilation Skill in neonatal intensive care Skill in pediatric intensive care
General Knowledge	Knowledge of pharmacology Knowledge of pulmonary disease Knowledge of how patients respond to life support

Table B.2b (continued)
Respiratory Therapist:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **More Important**
Administrative and Communication	Ability to accurately record treatments and patient's condition Ability to pay attention to detail in monitoring patients and keeping records Ability to organize time efficiently and keep to schedules

Table B.2c
Respiratory Therapist:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **Somewhat More Important**
Assessment and Diagnosis	Ability to calibrate blood gas analyzer machines Ability to conduct pulmonary screening exams Ability to interpret implications of vital signs for treatment Ability to read and interpret reports on patients from prior shifts of RTs Knowledge of normal blood gas content and pH Skill in monitoring the patient's heart rate, breath sounds, and general appearance
Treatment	Ability to assess when a physician needs to be called Ability to conduct cardiac treadmill tests Ability to conduct EKG Ability to fill physician's orders for treatment Ability to ventilate the patient with a manual resuscitator bag Ability to work general hospital floor Ability to work in surgery Ability to work in the emergency room Knowledge of hospital respiratory care routines and procedures

Table B.2c (continued)
Respiratory Therapist:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **Somewhat More Important**
Treatment	Skill in assisting with bronchoscopy Skill in high frequency jet ventilation Skill in pulmonary rehabilitation Skill in responding to cardiac arrest with resuscitation equipment Skill in suctioning patients Skill in using a nebulizer
General Knowledge	Knowledge of chemistry Knowledge of human physiology Knowledge of human anatomy Knowledge of cardiopulmonary anatomy Knowledge of respiratory physiology and anatomy Knowledge of microbiology Knowledge of pathology Knowledge of blood chemistry Knowledge of statistics and statistical analysis Knowledge of physics Ability to apply anatomy and physiology to assess patient condition Ability to conduct algebraic calculations on hand calculators Skills in computer programming
Administrative and Communication	Ability to describe treatments to patients Ability to develop relationships with patients Ability to communicate with other therapists Ability to be assertive with physicians and nurses Ability to make quick decisions during crises Ability to communicate with patients who cannot speak Ability to be patient during difficult and lengthy procedures Knowledge of hospital recordkeeping procedures Ability to supervise other staff Ability to write in prose (such as memos and reports) Knowledge of medical terminology Knowledge of third party payer rules for reimbursement

Table B.2d
Respiratory Therapist:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **Not More Important**
Assessment and Diagnosis	Ability to take arterial blood samples
Treatment	Ability to conduct echocardiograms Knowledge of how to set oxygen flow rates Skill in administering oxygen therapy (masks) Skill in Intermittent Positive Pressure Breathing Skill in intubation Skill in physiotherapy Skill in postural draining
General Knowledge	None
Administrative and Communication	None

Table B.3a
Respiratory Therapist:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Very Important**
Assessment and Diagnosis	Ability to determine if physician's orders are appropriate Ability to read and interpret reports on patients from prior shifts of RTs Skill in monitoring the patient's heart rate, breath sounds, and general appearance Ability to read and interpret heart and respiratory monitors Ability to interpret implications of vital signs for treatment Ability to assess patients' condition based on exam and tests Ability to conduct blood gas analysis

Table B.3a (continued)
Respiratory Therapist:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement
	Very Important
Assessment and Diagnosis	Ability to calibrate blood gas analyzer machines Knowledge of normal blood gas content and pH Ability to conduct pulmonary screening exams Ability to determine when to take patient off respirator Ability to assess when a physician needs to be called Ability to apply anatomy and physiology to assess patient condition
Treatment	Knowledge of hospital respiratory care routines and procedures Ability to fill physician's orders for treatment Knowledge of how to operate different ventilators Ability to use digitalized ventilators Knowledge of how ventilators assist patients breathing Ability to determine the most appropriate ventilator for a patient Knowledge of what effect ventilators should have on the patient Skill in administering oxygen therapy (masks) Knowledge of how to set oxygen flow rates Knowledge of set inspiratory and expiratory rates Ability to use pressure support ventilator Skill in nasal ventilation Skill in high frequency jet ventilation Skill in Intermittent Positive Pressure Breathing Ability to administer aerosol drugs Skill in using a nebulizer Skill in bronchodilator therapy Ability to identify potential drug interactions with adverse responses before administering drugs Skill in suctioning patients Skill in assisting with bronchoscopy Skill in responding to cardiac arrest with resuscitation equipment Ability to ventilate the patient with a manual resuscitator bag Skill in postural draining Skill in physiotherapy Ability to administer respiratory care during patient transport

Table B.3a (continued)
Respiratory Therapist:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement
	Very Important
Treatment	Ability to work in critical care
	Ability to work in the emergency room
	Ability to work general hospital floor
	Skill in neonatal intensive care
	Skill in pediatric intensive care
	Skill in equipment set up and maintenance
General Knowledge	Knowledge of chemistry
	Knowledge of human physiology
	Knowledge of human anatomy
	Knowledge of pharmacology
	Knowledge of cardiopulmonary anatomy
	Knowledge of respiratory physiology and anatomy
	Knowledge of microbiology
	Knowledge of pulmonary disease
	Knowledge of pathology
	Knowledge of blood chemistry
	Knowledge of physics
	Knowledge of how patients respond to life support
	Skills in computer utilization
Administrative and Communication	Ability to describe treatments to patients
	Ability to develop relationship with patients
	Ability to communicate with other therapists
	Ability to be assertive with physicians and nurses
	Ability to make quick decisions during crises
	Ability to accurately record treatments and patient's condition
	Ability to pay attention to detail in monitoring patients and keeping records
	Ability to communicate with patients who cannot speak
	Ability to be patient during difficult and lengthy procedures
	Knowledge of hospital record-keeping procedures
	Ability to organize time efficiently and keep to schedules
	Ability to supervise other staff
	Ability to write in prose (such as memos and reports)
	Knowledge of medical terminology
	Knowledge of third-party payer rules for reimbursement
	Ability to describe patient's condition to physician

Table B.3b
Respiratory Therapist:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement
	Moderately Important
Assessment and Diagnosis	None
Treatment	Skill in Intermittent Positive Pressure Breathing Skill in pulmonary rehabilitation Ability to function as a hemodynamic assistant Ability to conduct EKG Ability to work in surgery Ability to work in home care setting Skill in pulmonary rehabilitation
General Knowledge	Knowledge of statistics and statistical analysis Ability to conduct algebraic calculations on hand calculators Skills in computer programming
Administrative and Communication	None

Table B.3c
Respiratory Therapist:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement
	Somewhat Important
Assessment and Diagnosis	None
Treatment	Skill in intubation Ability to conduct cardiac treadmill tests Ability to assist with cardiac catheterization Ability to conduct echocardiograms Ability to conduct procedure to wean patients from respirators
General Knowledge	None
Administrative and Communication	None

Table B.3d
Respiratory Therapist:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Not Important**
Assessment and Diagnosis	Ability to take arterial blood samples
Treatment	None
General Knowledge	None
Administrative and Communication	None

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Table B.4a
Physical Therapist:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry
	Very Important
Assessment and Diagnosis	Ability to assess patient symptoms to diagnose injury or illness
	Ability to conduct manual tests of strength and range of motion
	Ability to develop an appropriate treatment plan
	Ability to execute physician's prescribed treatment plan
	Ability to recognize illness or injury requiring medical treatment
	Ability to take patient history
	Knowledge of questions to ask for an accurate medical history
	Knowledge of which tests are appropriate for each patient
	Testing of systems (e.g., pulmonary, neurological, metabolic)
Treatment	Ability to assess whether patient is responding to treatment
	Ability to conduct goniometric measurement
	Ability to develop an at-home treatment and exercise plan
	Ability to record treatment and patients' responses
	Ability to teach patients at-home treatment and exercises
	Ability to work with medical patients (e.g., stroke)
	Ability to work with post-surgical patients
	Knowledge of expected response to specific treatments
	Knowledge of geriatrics and therapies for elder individuals
	Knowledge of neck and back injuries and treatment
	Knowledge of occupational therapy
	Knowledge of sports medicine
	Knowledge of the best modalities to treat each injury or disease
	Knowledge of therapeutic exercises appropriate for different illness, injury or disease
	Skill in analyzing patient symptoms and responses to therapy

Table B.4a (continued)
Physical Therapist:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry
	Very Important
Treatment	Skill in applying electric stimulation Skill in applying manual manipulation techniques Skill in applying massage techniques Skill in applying therapeutic hot and cold packs Skill in applying therapeutic ultrasound Skill in applying traction Skill in teaching patients to regain mobility (gait training, transfer training, ambulation)
Basic Knowledge	Ability to provide patient care Knowledge of cardiac functioning, conditions, and functioning Knowledge of disease process and effects on body functions Knowledge of kinesiology Knowledge of muscular anatomy Knowledge of neurology related to muscle function Knowledge of other anatomy (organs, circulatory systems, etc) Knowledge of pharmacology (for planning treatments) Knowledge of physics Knowledge of physiology Knowledge of skeletal anatomy Knowledge of the normal range of motion Knowledge of the principals of electricity Physical strength to lift and move patients Skill in problem-solving
Administrative and Communication	Ability to be assertive with patients and physicians Ability to supervise aides and clerical staff Ability to supervise physical therapy assistants Ability to work as a team member with other health professionals Ability to work independent of supervision Knowledge of basic sociology and psychology Knowledge of how to communicate with physicians verbally and in writing on patient's progress

Table B.4a (continued)
Physical Therapist:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Very Important**
Administrative and Communication	Knowledge of medical terminology Knowledge of third party payer rules for reimbursement Skills in communicating with the patients Understanding of the legal and ethical parameters of practice Written communication skills (ability to write memos and reports)

Table B.4b
Physical Therapist:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Moderately Important**
Assessment and Diagnosis	None
Treatment	Ability to identify/recommend solutions for architectural barriers Skill in applying external dressings and supports Skill in applying hydrotherapy Skill in applying intermittent venous compression
Basic Knowledge	Ability to accurately complete mathematic calculations
Administrative and Communication	Ability to train assistants Ability to train physical therapists Knowledge of small business administration

Table B.4c
Physical Therapist:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Somewhat Important**
Assessment and Diagnosis	None
Treatment	Skill in applying diathermia Skill in administration of ultraviolet for different illness, injury, or disease
Basic Knowledge	None
Administrative and Communication	None

Table B.4d
Physical Therapist:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Not Important**
Assessment and Diagnosis	Ability to conduct manual tests for condition of tissues and joints
Treatment	None
Basic Knowledge	None
Administrative and Communication	None

Table B.5a
Physical Therapist:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **Much More Important**
Assessment and Diagnosis	None
Treatment	Skill in applying manual manipulation techniques
Basic Knowledge	None
Administrative and Communication	None

Table B.5b
Physical Therapist:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **More Important**
Assessment and Diagnosis	Ability to take patient history Ability to assess patient symptoms to diagnose injury or illness Knowledge of questions to ask for an accurate medical history Ability to recognize illness or injury requiring medical treatment Ability to develop an appropriate treatment plan Knowledge of which tests are appropriate for each patient
Treatment	Ability to assess whether patient is responding to treatment Ability to develop an at-home treatment and exercise plan

Table B.5b (continued)
Physical Therapist:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance
	More Important
Treatment	Ability to identify/recommend solutions for architectural barriers
	Ability to record treatment and patients' responses
	Ability to teach patients at-home treatment and exercises
	Ability to work with post-surgical patients
	Knowledge of geriatrics and therapies for elder individuals
	Knowledge of neck and back injuries and treatment
	Knowledge of sports medicine
	Knowledge of the best modalities to treat each injury or disease
	Knowledge of therapeutic exercises appropriate for different illness, injury, or disease
	Skill in analyzing patient symptoms and responses to therapy
Basic Knowledge	Knowledge of cardiac functioning, conditions, and functioning
	Knowledge of disease process and effects on body functions
	Knowledge of kinesiology
	Knowledge of neurology related to muscle function
	Skill in problem-solving
Administrative and Communication	Ability to be assertive with patients and physicians
	Ability to supervise physical therapy assistants
	Ability to train assistants
	Ability to train physical therapists
	Ability to work as a team member with other health professionals
	Ability to work independent of supervision
	Knowledge of how to communicate with physicians
	Knowledge of small business administration
	Knowledge of third party payer rules for reimbursement
	Understanding of the legal and ethical parameters of practice
	Written communication skills (ability to write memos and reports)

Table B.5c
Physical Therapist:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance
	Somewhat More Important
Assessment and Diagnosis	Ability to conduct manual tests of strength and range of motion
	Testing of systems (e.g., pulmonary, neurological, metabolic)
Treatment	Ability to work with medical patients (e.g., stroke)
	Knowledge of expected response to specific treatments
	Knowledge of occupational therapy
	Skill in applying electric stimulation
	Skill in applying external dressings and supports
	Skill in applying massage techniques
	Skill in applying therapeutic ultrasound
	Skill in applying traction
	Skill in teaching patients to regain mobility (gait training, transfer training, ambulation)
Basic Knowledge	Ability to provide patient care
	Knowledge of muscular anatomy
	Knowledge of other anatomy (organs, circulatory systems, etc)
	Knowledge of pharmacology (for planning treatments)
	Knowledge of physiology
	Knowledge of skeletal anatomy
	Knowledge of the principals of electricity
	Physical strength to lift and move patients
Administrative and Communication	Ability to supervise aides and clerical staff
	Knowledge of basic sociology and psychology
	Knowledge of medical terminology
	Skills in communicating with the patients verbally and in writing on patient's progress

Table B.5d
Physical Therapist:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance
	Not More Important
Assessment and Diagnosis	Ability to conduct manual tests for condition of tissues and joints Ability to execute physician's prescribed treatment plan
Treatment	Ability to conduct goniometric measurement Skill in applying diathermia Skill in applying hydrotherapy Skill in applying intermittent venous compression Skill in applying therapeutic hot and cold packs Skill in the administration of ultraviolet for different illness, injury, or disease
Basic Knowledge	Ability to accurately complete mathematic calculations Knowledge of physics Knowledge of the normal range of motion
Administrative and Communication	None

Table B.6a
Physical Therapist:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement
	Very Important
Assessment and Diagnosis	Ability to take patient history
	Ability to assess patient symptoms to diagnose injury or illness
	Knowledge of questions to ask for an accurate medical history
	Ability to recognize illness or injury requiring medical treatment
	Ability to conduct manual tests for condition of tissues and joints
	Ability to develop an appropriate treatment plan
	Knowledge of which tests are appropriate for each patient
	Testing of systems (e.g., pulmonary, neurological, metabolic)
Treatment	Ability to assess whether patient is responding to treatment
	Ability to develop an at-home treatment and exercise plan
	Ability to record treatment and patients' responses
	Ability to teach patients at-home treatment and exercises
	Ability to work with medical patients (e.g., stroke)
	Ability to work with post-surgical patients
	Knowledge of expected response to specific treatments
	Knowledge of geriatrics and therapies for elder individuals
	Knowledge of neck and back injuries and treatment
	Knowledge of sports medicine
	Knowledge of the best modalities to treat each injury or disease
	Knowledge of therapeutic exercises appropriate
	Skill in analyzing patient symptoms and responses to therapy
	Skill in applying manual manipulation techniques
	Skill in applying massage techniques
	Skill in teaching patients to regain mobility (gait training, transfer training, ambulation)

Table B.6a (continued)
Physical Therapist:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Very Important**
Basic Knowledge	Ability to provide patient care
	Knowledge of cardiac functioning, conditions, and functioning
	Knowledge of disease process and effects on body functions
	Knowledge of kinesiology
	Knowledge of muscular anatomy
	Knowledge of neurology related to muscle function
	Knowledge of physiology
	Knowledge of skeletal anatomy
	Knowledge of the normal range of motion
	Skill in problem-solving
Administrative and Communication	Ability to supervise physical therapy assistants
	Ability to train physical therapists
	Ability to train assistants
	Ability to supervise aides and clerical staff
	Ability to work as a team member with other health professionals
	Ability to work independent of supervision
	Ability to be assertive with patients and physicians
	Knowledge of how to communicate with physicians verbally and in writing on patient's progress
	Skills in communicating with the patients
	Knowledge of basic sociology and psychology
	Written communication skills (ability to write memos and reports)
	Knowledge of medical terminology
	Understanding of the legal and ethical parameters of practice
	Knowledge of small business administration
	Knowledge of third party payer rules for reimbursement

Table B.6b
Physical Therapist:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement
	Moderately Important
Assessment and Diagnosis	Ability to execute physician's prescribed treatment plan
Treatment	Ability to conduct goniometric measurement Ability to identify/recommend solutions for architectural barriers Knowledge of occupational therapy Skill in applying electric stimulation Skill in applying external dressings and supports Skill in applying therapeutic hot and cold packs Skill in applying therapeutic ultrasound Skill in applying traction
Basic Knowledge	Ability to accurately complete mathematic calculations Knowledge of other anatomy (organs, circulatory systems, etc) Knowledge of pharmacology (for planning treatments) Knowledge of physics Knowledge of the principals of electricity Physical strength to lift and move patients
Administrative and Communication	None

Table B.6c
Physical Therapist:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Somewhat Important**
Assessment and Diagnosis	None
Treatment	Skill in applying hydrotherapy Skill in applying intermittent venous compression
Basic Knowledge	None
Administrative and Communication	None

Table B.6d
Physical Therapist:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Not Important**
Assessment and Diagnosis	Ability to conduct manual tests for conditions of tissues and joints
Treatment	Skill in applying diathermia Skill in the administration of ultraviolet for different illness, injury, or disease
Basic Knowledge	None
Administrative and Communication	None

Table B.7a
Physical Therapy Assistant:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry
	Very Important
Assessment and Diagnosis	Knowledge of questions to ask for an accurate medical history
	Ability to assess patient symptoms to diagnose injury or illness
	Skill in analyzing patient symptoms and responses to therapy
	Ability to recognize illness or injury requiring medical treatment
	Ability to conduct manual tests of strength and range of motion
	Ability to execute physician's treatment plan
	Ability to execute physical therapist's treatment plan
Treatment	Ability to assess if patient is responding to treatment
	Ability to identify need to change treatment plans
	Ability to modify a treatment plan
	Ability to develop home treatment and exercise plans
	Ability to teach patient how to execute at-home exercise plan
	Ability to record treatment and patients' responses
	Knowledge of the best modalities to treat each injury or disease
	Knowledge of expected response to specific treatments
	Knowledge of therapeutic exercises appropriate for different illness, injury, or disease
	Ability to choose modalities and treatments (independent of the therapist) based on diagnosis
	Skill in applying hot and cold packs
	Skill in applying traction
	Skill in teaching patients to regain mobility (gait training, transfer training, ambulation)
	Skill in applying massage techniques
	Skill in applying electric stimulation
	Skill in applying therapeutic ultrasound
	Ability to work with post-surgical patients
	Ability to work with medical patients (e.g., stroke)
	Knowledge of neck and back injuries and treatment
	Skill in applying hydrotherapy
	Knowledge of geriatrics and therapies for older individuals
	Knowledge of sports medicine
	Knowledge of orthopedics

Table B.7a (continued)
Physical Therapy Assistant:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Very Important**
Basic Knowledge and Ability	Knowledge of physiology Knowledge of neurology related to muscle function Knowledge of muscular anatomy Knowledge of skeletal anatomy Knowledge of other anatomy (organs, circulatory systems, etc) Knowledge of disease process and effect on body functions Knowledge of cardiac functioning, conditions, and functioning Knowledge of kinesiology Knowledge of basic physics Knowledge of the normal range of motion Skill in problem-solving Ability to provide patient care Physical strength to lift and move patients
Administrative and Communication	Ability to work without constant supervision by a physical therapist Ability to be assertive with patients and physicians Knowledge of how to communicate with physicians verbally and in writing on patient's progress Knowledge of how to communicate with physical therapists verbally and in writing on patient's progress Skills in communicating with the patients Knowledge of basic sociology and psychology Understanding of the legal and ethical parameters of practice Written communication skills (ability to write in prose, such as memos and reports) Knowledge of medical terminology

Table B.7b
Physical Therapy Assistant:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Moderately Important**
Assessment and Diagnosis	Ability to take patient history Knowledge of which tests are appropriate for each patient Ability to choose modality or treatment procedure based on therapist's diagnosis
Treatment	Skill in applying electrical stimulation Knowledge of occupational therapy
Basic Knowledge and Ability	Knowledge of the principals of electricity Ability to accurately complete mathematic calculations
Administrative and Communication	Ability to work without constant supervision by a physical therapist Ability to assist in training of new physical therapy assistants or students

Table B.7c
Physical Therapy Assistant:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Somewhat Important**
Assessment and Diagnosis	No items classified in this category
Treatment	Skill in applying diathermia Skill in applying manual manipulation techniques
Basic Knowledge and Ability	Knowledge of pharmacology
Administrative and Communication	Knowledge of third party payer rules for reimbursement

Table B.7d
Physical Therapy Assistant:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Not Important**
Assessment and Diagnosis	No items classified in this category
Treatment	No items classified in this category
Basic Knowledge and Ability	No items classified in this category
Administrative and Communication	No items classified in this category

Table B.8a
Physical Therapy Assistant:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **Much More Important**
Assessment and Diagnosis	Skill in analyzing patient symptoms and responses to therapy
Treatment	None
Basic Knowledge and Ability	None
Administrative and Communication	None

Table B.8b
Physical Therapy Assistant:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance
	More Important
Assessment and Diagnosis	Ability to recognize injury or illness requiring medical treatment
	Knowledge of which tests are appropriate for each patient
	Ability to choose modality or treatment procedure based on therapist's diagnosis
Treatment	Ability to assess whether patient is responding to treatment
	Ability to identify when a treatment plan must be changed
	Ability to modify a treatment plan
	Ability to develop an at-home treatment and exercise plan
	Ability to record treatment and patients' responses
	Knowledge of the best modalities to treat each injury or disease
	Knowledge of expected response to specific treatments
	Knowledge of therapeutic exercises appropriate for different illness, injury, or disease
	Ability to choose modalities and treatments (independent of the therapist) based on diagnosis
	Skill in applying diathermia
	Skill in teaching patients to regain mobility (gait training, transfer training, ambulation)
	Skill in applying manual manipulation techniques
	Skill in applying electric stimulation
	Ability to work with post-surgical patients
	Ability to work with medical patients (e.g., stroke)
	Knowledge of neck and back injuries and treatment
	Knowledge of geriatrics and therapies for elder individuals
	Knowledge of sports medicine
	Knowledge of orthopedics
	Knowledge of occupational therapy

Table B.8b (continued)
Physical Therapy Assistant:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **More Important**
Basic Knowledge and Ability	Ability to provide patient care
	Knowledge of cardiac functioning, conditions, and functioning
	Knowledge of neurology related to muscle function
	Knowledge of other anatomy (organs, circulatory systems, etc)
	Knowledge of physiology
	Physical strength to lift and move patients
	Skill in problem-solving
Administrative and Communication	Ability to work without constant supervision by a physical therapist
	Ability to assist in training of new physical therapy assistants or students
	Ability to be assertive with patients and physicians
	Knowledge of how to communicate with physicians verbally and in writing on patient's progress
	Knowledge of how to communicate with physical therapists verbally and in writing on patient's progress
	Skills in communicating with the patients
	Understanding of the legal and ethical parameters of practice
	Knowledge of medical terminology

Table B.8c
Physical Therapy Assistant:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **Somewhat More Important**
Assessment and Diagnosis	Ability to take patient history Knowledge of questions to ask for an accurate medical history Ability to assess patient symptoms to diagnose injury or illness Ability to conduct manual tests of strength and range of motion Ability to conduct manual tests for condition of tissues and joints Ability to execute physical therapist's treatment plan Ability to teach patient how to execute at-home exercise plan Skill in applying hydrotherapy Skill in applying traction Skill in applying massage techniques
Basic Knowledge and Ability	Knowledge of basic physics Knowledge of disease process and effect on body functions Knowledge of kinesiology Knowledge of muscular anatomy Knowledge of pharmacology (for planning treatments) Knowledge of skeletal anatomy Knowledge of the normal range of motion Knowledge of the principals of electricity
Administrative and Communication	Ability to supervise aides and clerical staff Knowledge of basic sociology and psychology Written communication skills (ability to write in prose, such as memos and reports)

Table B.8d
Physical Therapy Assistant:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **Not More Important**
Assessment and Diagnosis	Ability to execute physician's prescribed treatment plan
Treatment	Skill in applying hot and cold packs Skill in applying therapeutic ultrasound
Basic Knowledge and Ability	Ability to accurately complete mathematic calculations
Administrative and Communication	Knowledge of third party payer rules for reimbursement

Table B.9a
Physical Therapy Assistant:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Very Important**
Assessment and Diagnosis	Knowledge of questions to ask for an accurate medical history
	Ability to assess patient symptoms to diagnose injury or illness
	Skill in analyzing patient symptoms and responses to therapy
	Ability to recognize illness or injury requiring medical treatment
	Ability to conduct manual tests of strength and range of motion
	Ability to conduct manual tests for condition of tissues and joints
	Ability to execute physician's prescribed treatment plan
	Ability to execute physical therapist's treatment plan
	Knowledge of which tests are appropriate for each patient
	Ability to choose modality or treatment procedure based on therapist's diagnosis
Treatment	Ability to assess whether patient is responding to treatment
	Ability to identify when a treatment plan must be changed
	Ability to modify a treatment plan
	Ability to develop an at-home treatment and exercise plan
	Ability to teach patient how to execute at-home exercise plan
	Ability to record treatment and patients' responses
	Knowledge of the best modalities to treat each injury or disease
	Knowledge of expected response to specific treatments
	Knowledge of therapeutic exercises appropriate for different illness, injury, or disease
	Ability to choose modalities and treatments (independent of the therapist) based on diagnosis
	Skill in applying hydrotherapy
	Skill in apply hot and cold packs
	Skill in applying traction`
	Skill in teaching patients to regain mobility (gait training, transfer training, ambulation)

Table B.9a (continued)
Physical Therapy Assistant:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Very Important**
Treatment	Skill in applying manual manipulation techniques Skill in applying massage techniques Skill in applying electric stimulation Skill in applying therapeutic ultrasound Ability to work with post-surgical patients Ability to work with medical patients (e.g., stroke) Knowledge of neck and back injuries and treatment Knowledge of geriatrics and therapies for elder individuals Knowledge of sports medicine Knowledge of orthopedics Knowledge of occupational therapy
Basic Knowledge and Ability	Knowledge of physiology Knowledge of neurology related to muscle function Knowledge of muscular anatomy Knowledge of skeletal anatomy Knowledge of other anatomy (organs, circulatory systems, etc) Knowledge of pharmacology (for planning treatments) Knowledge of disease process and effect on body functions Knowledge of cardiac functioning, conditions, and functioning Knowledge of kinesiology Knowledge of basic physics Knowledge of the normal range of motion Knowledge of the principals of electricity Skill in problem-solving Ability to provide patient care Physical strength to lift and move patients
Administrative and Communication	Ability to work without constant supervision by a physical therapist Ability to assist in training of new physical therapy assistants or students Ability to supervise aides and clerical staff Ability to be assertive with patients and physicians Knowledge of how to communicate with physicians verbally and in writing on patient's progress

Table B.9a (continued)
Physical Therapy Assistant:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Very Important**
Administrative and Communication	Knowledge of how to communicate with physical therapists verbally and in writing on patient's progress Skills in communicating with the patients Knowledge of basic sociology and psychology Understanding of the legal and ethical parameters of practice Written communication skills (ability to write in prose, such as memos and reports) Knowledge of medical terminology

Table B.9b
Physical Therapy Assistant:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Moderately Important**
Assessment and Diagnosis	Ability to take patient history
Treatment	None
Basic Knowledge and Ability	Ability to accurately complete mathematic calculations
Administrative and Communication	Knowledge of third party payer rules for reimbursement

Table B.9c
Physical Therapy Assistant:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Somewhat Important**
Assessment and Diagnosis	None
Treatment	Skill in applying diathermia
Basic Knowledge and Ability	None
Administrative and Communication	None

Table B.9d
Physical Therapy Assistant:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Not Important**
Assessment and Diagnosis	None
Treatment	None
Basic Knowledge and Ability	None
Administrative and Communication	None

APPENDIX C
Medical Records Occupations Tables

Table C.1a
Medical Record Administrator:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry
	Very Important
General Management Skills	Ability to prepare and monitor budget
	Knowledge of financial management principles
	Ability to negotiate with outside contractors
	Ability to develop purchasing specifications
	Ability to review contracts
	Ability to manage work flow efficiency
	Ability to assess the quality of the department's services
	Ability to manage on-site physical storage of records
	Ability to manage off-site physical storage of records
	Knowledge of records storage for other than medical records
	Ability to manage change
	Ability to plan several years ahead
	Ability to solve problems systematically
	Ability to provide leadership within the department
	Ability to provide leadership within the hospital
Managing People	Ability to hire qualified staff
	Ability to organize staff scheduling
	Ability to supervise own staff
	Ability to supervise contract personnel
	Ability to listen
	Ability to motivate staff
	Ability to manage multicultural staff
	Ability to develop team approach to work
	Ability to keep staff informed of all department functions
	Ability to provide on-the-job training to entry-level staff
	Ability to support staff development opportunities

Table C.1a (continued)
Medical Record Administrator:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Very Important**
Managing Technology	Ability to develop new information/management systems Knowledge of general capabilities of computer info systems Knowledge of computer hardware Knowledge of computer software Ability to keep informed of available med. rec. software Ability to keep informed of available financial software Ability to develop integrated computer systems w/other departments Ability to develop policies for data input into integrated systems Knowledge of computerized patient index Knowledge of automated record tracking Ability to assess alternative storage methods Knowledge of computerized microfiche storage Knowledge of optical disk storage Knowledge of fully automated record system Skill in using a computer keyboard Skill in using word processing programs Skill in using spread sheet programs
Managing Technical Procedures	Ability to develop policies for unclear areas in coding Ability to develop policies for unclear areas in DRG assignment Ability to develop policies for what should be abstracted Ability to develop policies for what should be monitored/analyzed Ability to develop policies to optimize DRG reimbursement Ability to keep up with abstracting requirements Ability to keep up with changes in codes (ICD-9, CPT-4)

Table C.1a (continued)
Medical Record Administrator:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Very Important**
Managing Technical Procedures	Ability to keep up with changes in DRG categories
	Ability to keep up with documentation requirements
	Ability to set up a system to inform staff of changes in codes
	Ability to set up a system to inform staff of changes in DRG categories
	Knowledge of anatomy and physiology
	Knowledge of clinical procedures
	Knowledge of disease processes
	Knowledge of medical terminology
	Knowledge of professional ethics
	Knowledge of Quality Assurance procedures
	Knowledge of specific DRGs
	Skill in using medical records software (grouper, abstractor)
Managing Requests for Information	Knowledge of laws regarding confidentiality
	Ability to develop information release policies
	Knowledge of state and federal reporting requirements
	Ability to work with state and federal agencies
	Ability to work with medical staff requesting information
	Ability to work with patients
	Ability to work with lawyers
	Ability to work with researchers
	Ability to work with insurance companies
	Ability to communicate in writing
	Ability to communicate over the phone
	Ability to present information in court
	Ability to prepare statistical/research reports
Managing Hospital Relationships	Ability to communicate with hospital administration
	Ability to communicate with other department managers
	Ability to communicate with MIS personnel
	Ability to communicate with Quality Assurance personnel

Table C.1a (continued)
Medical Record Administrator:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Very Important**
Managing Hospital Relationships	Ability to communicate with Finance/Billing personnel Ability to communicate with Data Processing personnel Ability to communicate with physicians Ability to communicate with other medical and professional staff Skill in educating other professionals, e.g. about reimbursement Skill in diplomacy Skill in negotiating Skill in advocating for medical records concerns

Table C.1b
Medical Record Administrator:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Moderately Important**
General Management Skills	Knowledge of accounting
Managing People	Ability to develop recruitment strategies Ability to manage unionized staff
Managing Technology	None
Managing Technical Procedures	Ability to develop policies for compiling other hospital statistics Knowledge of Cancer Tumor Registration Knowledge of microbiology Knowledge of pharmacology Knowledge of specific codes
Managing Requests for Information	Knowledge of data processing/programming Knowledge of statistical analysis Knowledge of epidemiology
Managing Hospital Relationships	Skill in coalition building

Table C.1c
Medical Record Administrator:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Somewhat Important**
General Management Skills	None
Managing People	None
Managing Technology	None
Managing Technical Procedures	None
Managing Requests for Information	None
Managing Hospital Relationships	None

Table C.1d
Medical Record Administrator:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Not Important**
General Management Skills	None
Managing People	None
Managing Technology	None
Managing Technical Procedures	None
Managing Requests for Information	None
Managing Hospital Relationships	None

Table C.2a
Medical Record Administrator:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **Much More Important**
General Management Skills	Ability to develop purchasing specifications Ability to manage change Ability to manage work flow efficiency Ability to provide leadership within the department Ability to review contracts Ability to solve problems systematically Knowledge of financial management principles
Managing People	None
Managing Technology	Ability to assess alternative storage methods Ability to develop integrated computer systems w/other departments Ability to develop policies for data input into integrated systems Ability to keep informed of available medical records software Knowledge of automated record tracking Knowledge of computer hardware Knowledge of computer software Knowledge of fully automated record system Knowledge of general capabilities of computer information systems Skill in using spread sheet programs Skill in using word processing programs
Managing Technical Procedures	Ability to develop policies for unclear areas in coding Ability to develop policies to optimize DRG reimbursement Ability to keep up with changes in codes (ICD-9, CPT-4)
Managing Requests for Information	None
Managing Hospital Relationships	None

Table C.2b
Medical Record Administrator:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **More Important**
General Management Skills	Ability to assess the quality of the department's services Ability to manage off-site physical storage of records Ability to negotiate with outside contractors Ability to plan several years ahead Ability to prepare and monitor budget Ability to provide leadership within the hospital
Managing People	Ability to develop recruitment strategies Ability to develop team approach to work Ability to hire qualified staff Ability to manage multicultural staff Ability to motivate staff Ability to organize staff scheduling Ability to provide on-going training for staff to keep up w/the field Ability to supervise contract personnel Ability to support staff development opportunities
Managing Technology	Ability to keep informed of available financial software Ability to develop new information/management systems Knowledge of computerized microfiche storage Knowledge of computerized patient index Knowledge of optical disk storage Skill in using a computer keyboard
Managing Technical Procedures	Ability to develop policies for unclear areas in DRG assignment Ability to develop policies for what should be abstracted Ability to develop policies for what should be monitored/analyzed Ability to keep up with abstracting requirements

Table C.2b (continued)
Medical Record Administrator:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance
	More Important
Managing Technical Procedures	Ability to keep up with changes in DRG categories Ability to keep up with documentation requirements Ability to set up a system to inform staff of changes in codes Ability to set up a system to inform staff of changes in DRG categories Knowledge of professional ethics Knowledge of Quality Assurance procedures Knowledge of specific DRGs Skill in using medical records software (grouper, abstractor)
Managing Requests for Information	Ability to communicate in writing Ability to develop information release policies Ability to prepare statistical/research reports Ability to work with medical staff requesting information Ability to work with state and federal agencies Knowledge of data processing/programming Knowledge of laws regarding confidentiality Knowledge of state and federal reporting requirements
Managing Hospital Relationships	Ability to communicate with hospital administration Ability to communicate with other department managers Ability to communicate with MIS personnel Ability to communicate with Quality Assurance personnel Ability to communicate with Finance/Billing personnel Ability to communicate with Data Processing personnel Ability to communicate with physicians Ability to communicate with other medical and professional staff Skill in educating other professionals, e.g. about reimbursement Skill in diplomacy Skill in negotiating Skill in coalition building Skill in advocating for medical records concerns

Table C.2c
Medical Record Administrator:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance
	Somewhat More Important
General Management Skills	Ability to manage on-site physical storage of records Knowledge of accounting Knowledge of records storage for other than medical records
Managing People	Ability to keep staff informed of all department functions Ability to listen Ability to manage unionized staff Ability to provide on-the-job training to entry-level staff Ability to supervise own staff
Managing Technology	None
Managing Technical Procedures	Ability to develop policies for compiling other hospital statistics Knowledge of anatomy and physiology Knowledge of Cancer Tumor Registration Knowledge of clinical procedures Knowledge of disease processes Knowledge of medical terminology Knowledge of specific codes
Managing Requests for Information	Ability to communicate over the phone Ability to present information in court Ability to work with insurance companies Ability to work with lawyers Ability to work with patients Ability to work with researchers Knowledge of epidemiology Knowledge of statistical analysis
Managing Hospital Relationships	None

Table C.2d
Medical Record Administrator:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **Not More Important**
General Management Skills	None
Managing People	None
Managing Technology	None
Managing Technical Procedures	Knowledge of microbiology Knowledge of pharmacology
Managing Requests for Information	None
Managing Hospital Relationships	None

Table C.3a
Medical Record Administrator:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Very Important**
General Management Skills	Ability to prepare and monitor budget Knowledge of financial management principles Knowledge of accounting Ability to negotiate with outside contractors Ability to develop purchasing specifications Ability to review contracts Ability to manage work flow efficiency Ability to assess the quality of the department's services

Table C.3a (continued)
Medical Record Administrator:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement
	Very Important
General Management Skills	Ability to manage on-site physical storage of records
	Ability to manage off-site physical storage of records
	Knowledge of records storage for other than medical records
	Ability to manage change
	Ability to plan several years ahead
	Ability to solve problems systematically
	Ability to provide leadership within the department
	Ability to provide leadership within the hospital
Managing People	Ability to hire qualified staff
	Ability to develop recruitment strategies
	Ability to organize staff scheduling
	Ability to supervise own staff
	Ability to supervise contract personnel
	Ability to listen
	Ability to motivate staff
	Ability to manage multicultural staff
	Ability to manage unionized staff
	Ability to develop team approach to work
	Ability to keep staff informed of all department functions
	Ability to provide on-the-job training to entry-level staff
	Ability to provide on-going training for staff to keep up w/the field
	Ability to support staff development opportunities
Managing Technology	Ability to develop new information/management systems
	Knowledge of general capabilities of computer information systems
	Knowledge of computer hardware
	Knowledge of computer software
	Ability to keep informed of available medical records software
	Ability to keep informed of available financial software
	Ability to develop integrated computer systems w/other departments

Table C.3a (continued)
Medical Record Administrator:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement
	Very Important
Managing Technology	Ability to develop policies for data input into integrated systems
	Knowledge of computerized patient index
	Knowledge of automated record tracking
	Ability to assess alternative storage methods
	Knowledge of computerized microfiche storage
	Knowledge of optical disk storage
	Knowledge of fully automated record system
	Skill in using a computer keyboard
	Skill in using word processing programs
	Skill in using spread sheet programs
Managing Technical Procedures	Ability to develop policies for compiling other hospital statistics
	Ability to develop policies for unclear areas in coding
	Ability to develop policies for unclear areas in DRG assignment
	Ability to develop policies for what should be abstracted
	Ability to develop policies for what should be monitored/analyzed
	Ability to develop policies to optimize DRG reimbursement
	Ability to keep up with abstracting requirements
	Ability to keep up with changes in codes (ICD-9, CPT-4)
	Ability to keep up with changes in DRG categories
	Ability to keep up with documentation requirements
	Ability to set up a system to inform staff of changes in codes
	Ability to set up a system to inform staff of changes in DRG categories
	Knowledge of anatomy and physiology
	Knowledge of disease processes
	Knowledge of medical terminology
	Knowledge of professional ethics
	Knowledge of Quality Assurance procedures
	Knowledge of specific DRGs
	Skill in using medical records software (grouper, abstractor)

Table C.3a (continued)
Medical Record Administrator:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement
	Very Important
Managing Requests for Information	Knowledge of laws regarding confidentiality Ability to develop information release policies Knowledge of state and federal reporting requirements Ability to work with state and federal agencies Ability to work with medical staff requesting information Ability to work with patients Ability to work with lawyers Ability to work with researchers Ability to work with insurance companies Ability to communicate in writing Ability to communicate over the phone Ability to prepare statistical/research reports Knowledge of data processing/programming Knowledge of statistical analysis
Managing Hospital Relationships	Ability to communicate with hospital administration Ability to communicate with other department managers Ability to communicate with MIS personnel Ability to communicate with Quality Assurance personnel Ability to communicate with Finance/Billing personnel Ability to communicate with Data Processing personnel Ability to communicate with physicians Ability to communicate with other medical/professional staff Skill in educating other professionals, e.g. about reimbursement Skill in diplomacy Skill in negotiating Skill in advocating for medical records concerns

Table C.3b
Medical Record Administrator:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Moderately Important**
General Management Skills	None
Managing People	None
Managing Technology	None
Managing Technical Procedures	Knowledge of Cancer Tumor Registration Knowledge of clinical procedures Knowledge of microbiology Knowledge of pharmacology Knowledge of specific codes
Managing Requests for Information	Ability to present information in court Knowledge of epidemiology
Managing Hospital Relationships	Skill in coalition building

Table C.3c
Medical Record Administrator:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Somewhat Important**
General Management Skills	None
Managing People	None
Managing Technology	None
Managing Technical Procedures	None
Managing Requests for Information	None
Managing Hospital Relationships	None

Table C.3d
Medical Record Administrator:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Not Important**
General Management Skills	None
Managing People	None
Managing Technology	None
Managing Technical Procedures	None
Managing Requests for Information	None
Managing Hospital Relationships	None

Table C.4a
Medical Record Technician:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Very Important**
Technical Procedures	Ability to communicate with medical staff over the phone Knowledge of medical terminology Knowledge of anatomy and physiology Knowledge of microbiology Knowledge of disease processes Knowledge of clinical procedures Ability to work quickly Ability to be accurate
Role of Technology	Ability to read computerized printouts Ability to use integrated computer system Knowledge of professional ethics Skill in using a computer keyboard
Requests for Information	Ability to communicate in writing Ability to communicate over the phone Ability to follow department policy regarding confidentiality Ability to read English Ability to speak English Ability to tabulate statistics Ability to use judgement when confidentiality procedure is unclear Ability to work with Medical Records staff as a member of a team Ability to work with medical staff requesting information Ability to work with multicultural staff Ability to work with the Finance/Billing department Ability to work with the Quality Assurance department Ability to write English Knowledge of basic math Knowledge of laws regarding confidentiality
Supervising Skills	None

Table C.4b
Medical Record Technician:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Moderately Important**
Technical Procedures	Ability to analyze records
	Knowledge of documentation requirements
	Ability to track down deficiencies
	Ability to communicate with medical staff in writing
	Ability to educate medical staff about documentation requirements
	Ability to code in-patient records
	Ability to code ambulatory surgery records
	Ability to code out-patient records
	Ability to code emergency room records
	Ability to code laboratory procedures
	Ability to code diagnoses
	Ability to code procedures
	Knowledge of ICD-9 codes
	Knowledge of CPT-4 codes
	Knowledge of HCPCS
	Knowledge of E-codes (external cause of injury)
	Knowledge of DRGs
	Ability to abstract information from records
	Ability to compile additional hospital statistics (other than abstract)
	Knowledge of pharmacology
	Knowledge of Quality Assurance procedures
Role of Technology	Ability to analyze computerized record
	Ability to analyze paper record
	Ability to code from computerized record
	Ability to code from paper record
	Ability to consult coding manual
	Ability to develop new medical records computer functions
	Ability to do concurrent coding
	Ability to enter chart deficiency information into computer
	Ability to fill out deficiency form
	Ability to judge when to disagree with computerized DRG output
	Ability to optimize reimbursement
	Ability to read handwritten notes

Table C.4b (continued)
Medical Record Technician:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Moderately Important**
Role of Technology	Ability to rely on encoder prompts for cc's
	Ability to rely on memory for coding
	Ability to use automated record tracking
	Ability to use computerized abstracting system
	Ability to use computerized grouper to assign DRGs
	Ability to use computerized list of codes/classifications
	Ability to use computerized patient index
	Ability to use fully automated record system
	Knowledge of computer hardware
	Knowledge of computer software
	Knowledge of data base management
	Knowledge of DRG documentation requirements
	Knowledge of general capabilities of computer information systems
	Skill in assigning DRGs using own knowledge
	Skill in looking for comorbidities and complications
	Skill in sequencing DRGs using own knowledge
	Skill in typing
	Skill in using spread sheet programs
	Skill in using word processing programs
Requests for Information	Ability to analyze statistics
	Ability to handle attorney requests
	Ability to handle HIV requests
	Ability to handle legal court orders
	Ability to handle other law enforcement agency requests
	Ability to handle research requests
	Ability to prepare statistical/research reports
	Ability to review subpoenas for release
	Ability to work with insurance companies
	Ability to work with lawyers
	Ability to work with patients
	Ability to work with researchers
	Ability to work with state and federal agencies
	Ability to work with the Data Processing department
	Ability to work with the hospital MIS department
	Knowledge of epidemiology
	Knowledge of statistical analysis

Table C.4b (continued)
Medical Record Technician:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry
	Moderately Important
Supervising Skills	Ability to foster team approach to work
	Ability to handle day to day operations
	Ability to listen
	Ability to organize scheduling of staff
	Ability to supervise department staff
	Ability to think systematically
	Ability to work with Quality Assurance personnel
	Skill in problem solving

Table C.4c
Medical Record Technician:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry
	Somewhat Important
Technical Procedures	Knowledge of ICD-O codes (oncology)
	Knowledge of severity indicators
	Knowledge of Cancer Tumor Registration
Role of Technology	Knowledge of programming
	Skill in transcription
Requests for Information	Ability to present information in court
	Ability to speak other languages
Supervising Skills	Ability to advise when coding procedure is unclear to staff
	Ability to advise when confidentiality procedure is unclear to staff
	Ability to advise when DRG assignment is unclear to staff
	Ability to help set dept. policies for abstracting information
	Ability to help set dept. policies for compiling hospital statistics

Table C.4c (continued)
Medical Record Technician:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Somewhat Important**
Supervising Skills	Ability to help set dept. policies for confidentiality procedures Ability to help set dept. policies for unclear areas in coding Ability to help set dept. policies for unclear areas in DRG assignments. Ability to help set dept. policies to optimize DRG reimbursement Ability to motivate staff Ability to resolve conflicts Ability to supervise contract personnel Ability to supervise multicultural staff Ability to train clerks Ability to train technicians Knowledge of coursework in supervision Knowledge of Quality Assurance procedures Skill in assessing quality of department's services

Table C.4d
Medical Record Technician:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Not Important**
Technical Procedures	Ability to communicate with medical staff in person
Role of Technology	None
Requests for Information	None
Supervising Skills	None

Table C.5a
Medical Record Technician:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **Much More Important**
Technical Procedures	Ability to code in-patient records Knowledge of CPT-4 codes Knowledge of ICD-9 codes
Role of Technology	Ability to use integrated computer system
Requests for Information	None
Supervising Skills	None

Table C.5b
Medical Record Technician:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **More Important**
Technical Procedures	Ability to abstract information from records Ability to analyze records Ability to be accurate Ability to code ambulatory surgery records Ability to code diagnoses Ability to code emergency room records Ability to code out-patient records Ability to code procedures Ability to communicate with medical staff in writing Ability to communicate with medical staff over the phone Ability to compile additional hospital statistics (other than abstract) Ability to educate medical staff about documentation requirements Ability to track down deficiencies Ability to work quickly Knowledge of anatomy and physiology

Table C.5b (continued)
Medical Record Technician:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance
	More Important
Technical Procedures	Knowledge of clinical procedures
	Knowledge of disease processes
	Knowledge of documentation requirements
	Knowledge of DRGs
	Knowledge of E-codes (external cause of injury)
	Knowledge of HCPCS
	Knowledge of medical terminology
	Knowledge of microbiology
	Knowledge of pharmacology
	Knowledge of Quality Assurance procedures
Role of Technology	Ability to code from computerized record
	Ability to code from paper record
	Ability to consult coding manual
	Ability to develop new medical records computer functions
	Ability to do concurrent coding
	Ability to enter chart deficiency information into computer
	Ability to fill out deficiency form
	Ability to judge when to disagree with computerized DRG output
	Ability to optimize reimbursement
	Ability to read computerized printouts
	Ability to read handwritten notes
	Ability to rely on encoder prompts for cc's
	Ability to use automated record tracking
	Ability to use computerized abstracting system
	Ability to use computerized grouper to assign DRGs
	Ability to use computerized patient index
	Ability to use fully automated record system
	Knowledge of computer hardware
	Knowledge of computer software
	Knowledge of data base management
	Knowledge of DRG documentation requirements
	Knowledge of general capabilities of computer information systems
	Knowledge of professional ethics
	Skill in assigning DRGs using own knowledge
	Skill in looking for comorbidities and complications
	Skill in sequencing DRGs using own knowledge
	Skill in using a computer keyboard

Table C.5b (continued)
Medical Record Technician:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance
	More Important
Requests for Information	Ability to communicate in writing
	Ability to communicate over the phone
	Ability to follow department policy regarding confidentiality
	Ability to handle HIV requests
	Ability to handle research requests
	Ability to prepare statistical/research reports
	Ability to use judgement when confidentiality procedure is unclear
	Ability to work with Medical Records staff as a member of a team
	Ability to work with multicultural staff
	Ability to work with the Data Processing department
	Ability to work with the Finance/Billing department
	Ability to work with the Quality Assurance department
	Knowledge of laws regarding confidentiality
Supervising Skills	Ability to advise when confidentiality procedure is unclear to staff
	Ability to advise when DRG assignment is unclear to staff
	Ability to help set dept. policies for unclear areas in DRG assignments
	Ability to help set dept. policies to optimize DRG reimbursement
	Ability to work with Quality Assurance personnel
	Knowledge of Quality Assurance procedures

Table C.5c
Medical Record Technician:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **Somewhat More Important**
Technical Procedures	Ability to code laboratory procedures
	Knowledge of Cancer Tumor Registration
	Knowledge of ICD-O codes (oncology)
	Knowledge of severity indicators
Role of Technology	Ability to analyze computerized record
	Ability to analyze paper record
	Ability to rely on memory for coding
	Ability to use computerized list of codes/classifications
	Knowledge of programming
	Skill in transcription
	Skill in using spread sheet programs
	Skill in using word processing programs
Requests for Information	Ability to analyze statistics
	Ability to handle attorney requests
	Ability to handle legal court orders
	Ability to handle other law enforcement agency requests
	Ability to present information in court
	Ability to read English
	Ability to review subpoenas for release
	Ability to speak English
	Ability to speak other languages
	Ability to tabulate statistics
	Ability to work with insurance companies
	Ability to work with lawyers
	Ability to work with medical staff requesting information
	Ability to work with patients
	Ability to work with researchers
	Ability to work with state and federal agencies
	Ability to work with the hospital MIS department
	Ability to write English
	Knowledge of epidemiology
	Knowledge of statistical analysis

Table C.5c (continued)
Medical Record Technician:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **Somewhat More Important**
Supervising Skills	Ability to advise when coding procedure is unclear to staff Ability to foster team approach to work Ability to handle day-to-day operations Ability to help set dept. policies for abstracting information Ability to help set dept. policies for compiling hospital statistics Ability to help set dept. policies for confidentiality procedures Ability to help set dept. policies for unclear areas in coding Ability to listen Ability to motivate staff Ability to organize scheduling of staff Ability to resolve conflicts Ability to supervise contract personnel Ability to supervise department staff Ability to supervise multicultural staff Ability to think systematically Ability to train clerks Ability to train technicians Knowledge of coursework in supervision Skill in assessing quality of department's services Skill in problem solving

Table C.5d

Medical Record Technician: Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **Not More Important**
Technical Procedures	Ability to communicate with medical staff in person
Role of Technology	Skill in typing
Requests for Information	Knowledge of basic math
Supervising Skills	None

Table C.6a

Medical Record Technician: Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Very Important**
Technical Procedures	Ability to abstract information from records Ability to be accurate Ability to code ambulatory surgery records Ability to code diagnoses Ability to code in-patient records Ability to code procedures Ability to communicate with medical staff over the phone Ability to compile additional hospital statistics (other than abstract) Ability to work quickly Knowledge of anatomy and physiology Knowledge of clinical procedures Knowledge of CPT-4 codes Knowledge of disease processes Knowledge of documentation requirements

Table C.6a (continued)
Medical Record Technician:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement
	Very Important
Technical Procedures	Knowledge of DRGs
	Knowledge of ICD-9 codes
	Knowledge of medical terminology
	Knowledge of microbiology
Role of Technology	Ability to read computerized printouts
	Ability to read handwritten notes
	Ability to use automated record tracking
	Ability to use computerized patient index
	Ability to use fully automated record system
	Ability to use integrated computer system
	Knowledge of computer hardware
	Knowledge of computer software
	Knowledge of general capabilities of computer information systems
	Knowledge of professional ethics
	Skill in using a computer keyboard
Requests for Information	Ability to communicate in writing
	Ability to communicate over the phone
	Ability to follow department policy regarding confidentiality
	Ability to handle legal court orders
	Ability to handle research requests
	Ability to prepare statistical/research reports
	Ability to read English
	Ability to speak English
	Ability to tabulate statistics
	Ability to use judgement when confidentiality procedure is unclear
	Ability to work with Medical Records staff as a member of a team
	Ability to work with medical staff requesting information
	Ability to work with multicultural staff
	Ability to work with the Data Processing department
	Ability to work with the Finance/Billing department
	Ability to work with Quality Assurance department
	Ability to write English
	Knowledge of basic math
	Knowledge of epidemiology
	Knowledge of laws regarding confidentiality
	Knowledge of statistical analysis
Supervising Skills	None

Table C.6b
Medical Record Technician:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement
	Moderately Important
Technical Procedures	Ability to analyze records
	Ability to code emergency room records
	Ability to code laboratory procedures
	Ability to code out-patient records
	Ability to communicate with medical staff in writing
	Ability to educate medical staff about documentation requirements
	Ability to track down deficiencies
	Knowledge of Cancer Tumor Registration
	Knowledge of E-codes (external cause of injury)
	Knowledge of HCPCS
	Knowledge of ICD-O codes (oncology)
	Knowledge of pharmacology
	Knowledge of Quality Assurance procedures
Role of Technology	Ability to analyze computerized record
	Ability to analyze paper record
	Ability to code from computerized record
	Ability to code from paper record
	Ability to consult coding manual
	Ability to develop new medical records computer functions
	Ability to do concurrent coding
	Ability to enter chart deficiency information into computer
	Ability to fill out deficiency form
	Ability to judge when to disagree with computerized DRG output
	Ability to optimize reimbursement
	Ability to rely on encoder prompts for cc's
	Ability to rely on memory for coding
	Ability to use computerized abstracting system
	Ability to use computerized grouper to assign DRGs
	Ability to use computerized list of codes/classifications
	Knowledge of data base management
	Knowledge of DRG documentation requirements
	Knowledge of programming
	Skill in assigning DRGs using own knowledge
	Skill in looking for comorbidities and complications
	Skill in sequencing DRGs using own knowledge
	Skill in typing
	Skill in using spread sheet programs
	Skill in using word processing programs

Table C.6b (continued)
Medical Record Technician:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Moderately Important**
Requests for Information	Ability to analyze statistics
	Ability to handle attorney requests
	Ability to handle HIV requests
	Ability to handle other law enforcement agency requests
	Ability to present information in court
	Ability to review subpoenas for release
	Ability to work with insurance companies
	Ability to work with lawyers
	Ability to work with patients
	Ability to work with researchers
	Ability to work with state and federal agencies
	Ability to work with the hospital MIS department
Supervising Skills	Ability to supervise department staff
	Ability to supervise contract personnel
	Ability to organize scheduling of staff
	Ability to listen
	Ability to motivate staff
	Ability to resolve conflicts
	Ability to supervise multicultural staff
	Ability to foster team approach to work
	Ability to train clerks
	Ability to train technicians
	Ability to advise when coding procedure is unclear to staff
	Ability to help set dept. policies for unclear areas in coding
	Ability to advise when DRG assignment is unclear to staff
	Ability to help set dept. policies for unclear areas in DRG assignments
	Ability to help set dept. policies to optimize DRG reimbursement
	Ability to advise when confidentiality procedure is unclear to staff
	Ability to help set dept. policies for confidentiality procedures
	Ability to help set dept. policies for abstracting information

Table C.6b (continued)
Medical Record Technician:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Moderately Important**
Supervising Skills	Ability to help set dept. policies for compiling hospital statistics Skill in assessing quality of department's services Knowledge of Quality Assurance procedures Ability to work with Quality Assurance personnel Ability to handle day to day operations Skill in problem solving Ability to think systematically Knowledge of coursework in supervision

Table C.6c
Medical Record Technician:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Somewhat Important**
Technical Procedures	Knowledge of severity indicators
Role of Technology	Skill in transcription
Requests for Information	Ability to speak other languages
Supervising Skills	None

Table C.6d
Medical Record Technician:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement **Not Important**
Technical Procedures	Ability to communicate with medical staff in person
Role of Technology	None
Requests for Information	None
Supervising Skills	None

Table C.7a
Medical Record Clerk:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Very Important**
Clerical Procedures	Ability to be accurate
	Ability to file records in place in file room
	Ability to pull records for appointments or requests
	Ability to recognize type or source of paperwork
	Ability to take orders for charts over the phone
	Ability to track location of records
	Ability to work quickly
	Knowledge of alphabetical filing system
	Knowledge of hospital departments
	Knowledge of numerical filing system
Technical Procedures	Ability to communicate with medical staff over the phone
	Ability to communicate with medical staff in person
Role of Technology	Ability to analyze paper record
	Ability to enter requests for information into computer
	Ability to read computerized printouts
	Ability to read handwritten notes
	Ability to retrieve information from computer
	Skill in typing
	Skill in using a computer keyboard
Requests for Information	Ability to follow department policy regarding confidentiality
	Ability to read English
	Ability to speak English
	Ability to write English
Organization of Work	Ability to work as a member of a team
	Ability to work with multicultural staff
	Ability to follow procedures carefully
	Ability to use independent judgement
	Skill in problem solving
	Ability to set priorities

Table C.7b
Medical Record Clerk:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry
	Moderately Important
Clerical Procedures	Ability to assemble charts
	Ability to deliver records to appropriate location
	Ability to file paperwork into records
	Ability to photocopy record information
	Knowledge of color-coded system
Technical Procedures	Ability to analyze records
	Knowledge of documentation requirements
	Ability to track down deficiencies
	Ability to communicate with medical staff in writing
	Ability to educate medical staff about documentation requirements
	Ability to code in-patient records
	Ability to code out-patient records
	Knowledge of ICD-9 codes
	Knowledge of CPT-4 codes
	Knowledge of DRGs
	Ability to abstract information from records
	Ability to compile additional hospital statistics (other than abstract)
Role of Technology	Ability to analyze computerized record
	Ability to enter chart deficiency information into computer
	Ability to enter orders for charts into computer
	Ability to fill out deficiency form
	Ability to use automated record tracking
	Ability to use computerized abstracting system
	Ability to use computerized patient index
	Ability to use fully automated record system
	Ability to use integrated computer system (info from many departments)
	Knowledge of computer hardware
	Knowledge of computer software
	Skill in using word processing programs

Table C.7b (continued)
Medical Record Clerk:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Moderately Important**
Requests for Information	Ability to handle HIV requests Ability to read written requests for information Ability to respond to requests in writing Ability to review subpoenas for release Ability to tabulate statistics Ability to use judgement when confidentiality procedure is unclear Ability to work with insurance companies Ability to work with medical staff requesting information Ability to work with patients Ability to work with researchers Ability to work with state and federal agencies Ability to work with the Data Processing department Ability to work with the Finance/Billing department Ability to work with the Quality Assurance department Knowledge of anatomy and physiology Knowledge of basic math Knowledge of clinical procedures Knowledge of disease processes Knowledge of laws regarding confidentiality Knowledge of medical terminology
Organization of Work	None

Table C.7c
Medical Record Clerk:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Somewhat Important**
Clerical Procedures	None
Technical Procedures	Ability to do transcription
Role of Technology	Ability to use computerized birth recording
Requests for Information	Ability to handle attorney requests Ability to handle legal court orders Ability to handle other law enforcement agency requests Ability to present information in court Ability to speak other languages Ability to work with lawyers Ability to work with the hospital MIS department
Organization of Work	Ability to supervise other clerks Ability to train other clerks

Table C.7d
Medical Record Clerk:
Skills, Knowledge, and Abilities Important for Entry-Level Job Performance

SKA Category	Level of Importance for Job Entry **Not Important**
Clerical Procedures	None
Technical Procedures	None
Role of Technology	None
Requests for Information	None
Organization of Work	None

Table C.8a
Medical Record Clerk:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **Much More Important**
Clerical Procedures	None
Technical Procedures	None
Role of Technology	Ability to retrieve information from computer Ability to use integrated computer system Skill in using a computer keyboard
Requests for Information	None
Organization of Work	None

Table C.8b
Medical Record Clerk:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **More Important**
Clerical Procedures	Ability to assemble charts Ability to be accurate Ability to recognize type or source of paperwork Ability to track location of records Ability to work quickly
Technical Procedures	Ability to analyze records Knowledge of documentation requirements Ability to track down deficiencies Ability to communicate with medical staff in writing Ability to communicate with medical staff over the phone Ability to communicate with medical staff in person Ability to educate medical staff about documentation requirements Ability to code in-patient records Ability to code out-patient records Knowledge of ICD-9 codes Knowledge of CPT-4 codes Knowledge of DRGs

Table C.8b (continued)
Medical Record Clerk:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance **More Important**
Technical Procedures	Ability to abstract information from records Ability to compile additional hospital statistics (other than abstract)
Role of Technology	Ability to analyze computerized record Ability to analyze paper record Ability to enter chart deficiency information into computer Ability to enter requests for information into computer Ability to fill out deficiency form Ability to read computerized printouts Ability to read handwritten notes Ability to use automated record tracking Ability to use computerized abstracting system Ability to use computerized birth recording Ability to use fully automated record system Knowledge of computer hardware Knowledge of computer software Skill in using word processing programs
Requests for Information	Ability to follow department policy regarding confidentiality Ability to handle HIV requests Ability to review subpoenas for release Ability to tabulate statistics Ability to use judgement when confidentiality procedure is unclear Ability to work with medical staff requesting information Ability to work with state and federal agencies Ability to work with the Data Processing department Ability to work with the Finance/Billing department Ability to work with the Quality Assurance dept. Knowledge of laws regarding confidentiality
Organization of Work	Ability to work as a member of a team Ability to work with multicultural staff Ability to train other clerks Ability to follow procedures carefully Ability to use independent judgement Skill in problem solving Ability to set priorities

Table C.8c
Medical Record Clerk:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance
	Somewhat More Important
Clerical Procedures	Ability to deliver records to appropriate location
	Ability to file paperwork into records
	Ability to file records in place in file room
	Ability to photocopy record information
	Ability to pull records for appointments or requests
	Ability to take orders for charts over the phone
	Knowledge of alphabetical filing system
	Knowledge of color-coded system
	Knowledge of hospital departments
	Knowledge of numerical filing system
Technical Procedures	Ability to do transcription
Role of Technology	Ability to enter orders for charts into computer
	Ability to use computerized patient index
	Skill in typing
Requests for Information	Ability to handle attorney requests
	Ability to handle legal court orders
	Ability to handle other law enforcement agency requests
	Ability to present information in court
	Ability to read English
	Ability to read written requests for information
	Ability to respond to requests in writing
	Ability to speak English
	Ability to speak other languages
	Ability to work with insurance companies
	Ability to work with lawyers
	Ability to work with patients
	Ability to work with researchers
	Ability to work with the hospital MIS department
	Ability to write English
	Knowledge of anatomy and physiology
	Knowledge of clinical procedures
	Knowledge of disease processes
	Knowledge of medical terminology
Organization of Work	None

Table C.8d
Medical Record Clerk:
Skills, Knowledge, and Abilities that Have Recently Gained in Importance

SKA Category	Gain in Importance
	Not More Important
Clerical Procedures	None
Technical Procedures	None
Role of Technology	None
Requests for Information	Knowledge of basic math
Organization of Work	Ability to supervise other clerks

Table C.9a
Medical Record Clerk:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement
	Very Important
Clerical Procedures	Ability to be accurate Ability to pull records for appointments or requests Ability to recognize type or source of paperwork Ability to track location of records Knowledge of alphabetical filing system Knowledge of color-coded system Knowledge of hospital departments Knowledge of numerical filing system
Technical Procedures	Ability to abstract information from records Ability to analyze records Ability to code in-patient records Ability to code out-patient records Ability to communicate with medical staff in person Ability to communicate with medical staff in writing Ability to communicate with medical staff over the phone Ability to educate medical staff about documentation requirements

Table C.9a
Medical Record Clerk:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement
	Very Important
Technical Procedures	Ability to track down deficiencies
	Knowledge of documentation requirements
	Knowledge of DRGs
	Knowledge of ICD-9 codes
Role of Technology	Ability to analyze computerized record
	Ability to analyze paper record
	Ability to read computerized printouts
	Ability to read handwritten notes
	Ability to retrieve information from computer
	Ability to use integrated computer system
	Skill in typing
	Skill in using a computer keyboard
Requests for Information	Ability to follow department policy regarding confidentiality
	Ability to read English
	Ability to read written requests for information
	Ability to respond to requests in writing
	Ability to speak English
	Ability to tabulate statistics
	Ability to use judgement when confidentiality procedure is unclear
	Ability to work with medical staff requesting information
	Ability to work with patients
	Ability to work with researchers
	Ability to work with state and federal agencies
	Ability to work with the Data Processing department
	Ability to work with the Finance/Billing department
	Ability to work with the Quality Assurance dept.
	Ability to write English
	Knowledge of anatomy and physiology
	Knowledge of basic math
	Knowledge of laws regarding confidentiality
	Knowledge of medical terminology
Organization of Work	Ability to work as a member of a team
	Ability to work with multicultural staff
	Ability to train other clerks
	Ability to follow procedures carefully
	Ability to use independent judgement
	Skill in problem solving
	Ability to set priorities

Table C.9b
Medical Record Clerk:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement
	Moderately Important
Clerical Procedures	Ability to assemble charts Ability to deliver records to appropriate location Ability to file paperwork into records Ability to file records in place in file room Ability to photocopy record information Ability to take orders for charts over the phone Ability to work quickly
Technical Procedures	Ability to compile additional hospital statistics (other than abstract) Ability to do transcription Knowledge of CPT-4 codes
Role of Technology	Ability to enter chart deficiency information into computer Ability to enter orders for charts into computer Ability to enter requests for information into computer Ability to fill out deficiency form Ability to use automated record tracking Ability to use computerized abstracting system Ability to use computerized birth recording Ability to use computerized patient index Ability to use fully automated record system Knowledge of computer hardware Knowledge of computer software Skill in using word processing programs
Requests for Information	Ability to handle attorney requests Ability to handle HIV requests Ability to handle legal court orders Ability to handle other law enforcement agency requests Ability to present information in court Ability to review subpoenas for release Ability to work with insurance companies Ability to work with lawyers Ability to work with the hospital MIS department Knowledge of clinical procedures Knowledge of disease processes
Organization of Work	Ability to supervise other clerks

Table C.9c
Medical Record Clerk:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement
	Somewhat Important
Clerical Procedures	None
Technical Procedures	None
Role of Technology	None
Requests for Information	Ability to speak other languages
Organization of Work	None

Table C.9d
Medical Record Clerk:
Skills, Knowledge, and Abilities Important for Job Advancement

SKA Category	Level of Importance for Job Advancement
	Not Important
Clerical Procedures	None
Technical Procedures	None
Role of Technology	None
Requests for Information	None
Organization of Work	None

APPENDIX D
Background Data and Survey Questionnaires
NCRVE Health Industry Study

JOB ANALYSIS INTERVIEW
BACKGROUND DATA AND INTERVIEW QUESTIONS
NCRVE HEALTH INDUSTRY STUDY

Interviewer Name

Occupational Cluster

SME and OIP

Job(s) to which interview applies

Interviewee Name and Title

Organization Name and Telephone

Department Name and Street Address

City State and Zip Code

Names and phone numbers of additional SMEs or OIPs we should contact:

How does this respondent know about this (these) job(s) [incumbent, former incumbent, supervisor, associate, such as other health practitioner, or instructor]?

How long has this respondent worked in this (these) job(s)?

Job #1 ____________________: how long?______________

Job #2 ____________________: how long?______________

Job #3 ____________________: how long?______________

Summary comments about interview:

JOB ANALYSIS INTERVIEW QUESTIONS
NCRVE HEALTH INDUSTRY STUDY
(Continued)

Respondent Name ______________________________

For each job where respondent has been identified as an SME or an OIP ask:

1. I'd like you to think about the way that you (or and individual) perform this job **today**? Would you now spend a few minutes telling me what are the typical duties or tasks you (or that individual) perform in this job on a **typical day**? For each of these major duties, would you also tell me the kinds of skills, knowledge, and abilities that are required to perform that job?

2. Next I'd like to focus on how this job has changed in recent years. Please think back to the list of tasks or duties that we have discussed. First, would you say that the duties required to perform this job have changed over the past 5 to 10 years? If so, which ones have changed and in what ways? Now, what about the skills, knowledge, and abilities required to perform these duties; how have they changed? About when did the change(s) begin to occur, and what are the reasons for this (or these) changes?

3. Now, I'd like to conclude this interview by asking you to think about the **future**. Are there factors that are likely to affect how this job will be performed, say, about five years from now? If yes, what are these factors? How will the duties in this job be different? Will different knowledge, abilities, and skills be necessary? What will they be?

NATIONAL CENTER FOR
RESEARCH IN
VOCATIONAL EDUCATION

HEALTH INDUSTRY STUDY
PHYSICAL THERAPY FOCUS GROUP QUESTIONNAIRE

Please complete this questionnaire and bring it with you to the physical therapy focus group meeting on Thursday, June 7, 1990. *Please answer these questions in relation to both physical therapists and physical therapy assistants.*

RECRUITMENT AND LABOR MARKET ISSUES

- Over the past year or two, how easy or difficult has it been for you to recruit and hire personnel in your department? If it has been difficult, why do you think this is the case? Has the local labor pool (within the San Francisco Bay Area) sufficiently met your needs, or have you had to recruit personnel from outside the geographical area? [*If you are an educator, please respond to this question in terms of the supply/demand conditions your students have faced in looking for employment after completion of their studies*].

- How qualified have applicants been for your open positions? If they have lacked qualifications, what have been their deficiencies? What have been their strengths? [*Have recent graduates of your program indicated that potential employers are satisfied with their training and qualifications? If not, what has been lacking?*]

- What level of education (high school graduation, additional certificate, AA/AS, BA/BS, or master's degree) do you feel is necessary for entry level positions within your field? Are these desired educational levels different from the actual levels required of job applicants?

- Describe briefly the demographic composition of the labor force within your department (sex, age, race/ethnicity). Has this demographic make-up changed in recent years? Do you foresee further changes over the next five years? If so, why? [*Have there been recent changes in the demographic make-up of students in your programs? Do you foresee further changes?*]

- Over the past year, how many openings have there been for personnel in each job classification in your department? Do you expect that openings for these positions will increase or decrease in the next year or two? Why?

CHANGING OCCUPATIONAL SKILL REQUIREMENTS

Communication Skills:

- How important are written and verbal communication skills for effective job performance in your field? Employers: have applicants for open positions in your department been lacking in communications skills? Employers and educators: what methods or evidence do you use to assess employees' or students' skills in this area?

Teamwork Skills:

- How important are teamwork skills for effective job performance in your field? Employers: have recently hired entry-level employees in your department been lacking in teamwork skills? Employers and educators, what methods or evidence do you use to assess employees' or students' skills in this area?

Technical Knowledge:

- Has the level of technical knowledge required in your field increased, decreased or remained about the same over the past few years? If it has increased, in what specific areas has this increase occurred? Employers, do entry-level applicants for open positions show evidence that their training has produced this higher level of technical knowledge?

CHANGES IN THE ORGANIZATION OF WORK

- In your opinion, are individuals in your occupational specialty now required to exercise greater independent judgment than they were in the past? If so, what might be an example of this situation? In general, why is this change occurring?
- What changes are occurring in the demographic characteristics of patients with whom you work? Are these changing characteristics affecting the tasks, duties and knowledge required of individuals in your occupational specialty? How?

CAREER PATHS IN PHYSICAL THERAPY OCCUPATIONS

- Is there a career path leading from other health care occupations or from physical therapy assisting to the physical therapist position? If yes, what is it? If not, why not? If not, should there be one?

- Do you observe that individuals who have been trained in other health care occupations are shifting careers and moving into your occupational specialty? If so, from what occupations are they migrating? How are they making these career changes, i.e., through on-the-job training, completion of some additional coursework, or completion of additional certificate programs or degrees?

- In your opinion, are there individuals in other health care occupations whose training and experience qualify them particularly well for career moves into your occupational specialty? If so, in what occupations are these individual now employed? What *specific* skills do these individuals have that make them attractive potential incumbents of your occupational specialty?

- Into what occupations are people in your occupational specialty transferring when leaving their present jobs? What additional training, if any, do their career moves necessitate (on the job training, additional coursework, additional programs or certificates, etc.)?

- In your opinion, are there any regulatory obstacles in California that could be modified to increase the availability of physical therapy assistants and physical therapists while still ensuring quality care?

- In your opinion, are there any other measures that could reasonably be implemented to increase the supply of individuals in physical therapy occupations?

Thank you for completing this questionnaire.
Please bring it with you to the Focus Group meeting
on June 7, 1990.

Name ______________________________

Job Title ______________________________

Department Name ______________________________

Organization Address ______________________________

____

______________________________ Telephone ______________

Your Occupational Specialty ______________________________

AGENDA

MEDICAL IMAGING FOCUS GROUP
NCRVE HEALTH INDUSTRY STUDY

Tuesday, March 6, 1990 *8:30 a.m. to 11:00 a.m.*
MPR Associates, Inc., Berkeley

8:30	Coffee and muffins	
9:00	Convene meeting and Introductions -- Penni Hudis, MPR Associates	
9:05	Review Health Industry Study Objectives	
9:10	Focus Group Discussion: Review Meeting Objectives	
9:15	Topic I	Changing Student Demographics
9:25	Topic II	Changing Occupational Skill Requirements
9:40	Topic III	Career Paths in Medical Imaging Occupations
10:00	Topic IV	Changes in the Organization of Work
10:20	Topic V	Recruitment and Labor Market Issues
10:40	Topic VI	Other Issues
10:50	Wrap-up of Meeting	
11:00	Adjourn	

NCRVE HEALTH INDUSTRY STUDY
FOCUS GROUP
DISCUSSION TOPICS

9:45 **Topic I Changing Employee/Student Demographics**

- changes in students'/employees' age and race/ethnicity
- movement of men/women into nontraditional jobs
- growth of language minorities

9:55 **Topic II Changing Occupational Skill Requirements**

- students'/employees' communications skills: deficiencies
- teamwork abilities: importance: deficiencies: examples

10:15 **Topic III Career Paths in [Physical Therapy] Occupations**

- are there career paths; should there be?
- recruitment of multiskilled employees; pay differentials

10:30 **Topic IV Changes in the Organization of Work**

- exercise of independent judgment
- autonomy from physicians
- productivity and quality of care

10:45 **Topic V Recruitment and Labor Market Issues**

- shortages; why;
- extent across industry

11:00 **Topic VI Policy Issues**

- reimbursement requirements
- licensing
- education policy

NCRVE STUDY OF CHANGING SKILLS AND EDUCATION REQUIREMENTS IN THE HEALTH PROFESSIONS

Radiation Therapy Technologists

The following is a list that includes skills and abilities you may need to have and types of knowledge that may be important to your job. For each skill, ability, or knowledge, please indicate (1) how the level of knowledge or skill required for your position has changed in the past five years; (2) how important this knowledge or skill is to obtain an entry-level position; and (3) how important this skill or knowledge is for you to advance in your occupation.

How has the level of this skill or knowledge changed over the past five years?	How important is this skill or knowledge to obtain entry-level job?	How important is this skill or knowledge for advancement?
1 = no longer important	1 = not at all important	1 = not at all important
2 = less important now	2 = of minor importance	2 = of minor importance
3 = no change	3 = important	3 = important
4 = more important now	4 = very important	4 = very important
5 = much more important	5 = critical	5 = critical

Job skill, ability, or knowledge	Change in past 5 yrs	How important for entry level?	How important to advance?
Procedural			
skill in preparing patient for exam	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of patient transfer and positioning	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in positioning equipment and setting controls	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in administering radiation therapy treatments accurately	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in image development	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to evaluate images for technical quality	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to interpret previous diagnostic test results	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	How has the level of this skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	How important is this skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	How important is this skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
ability to read MRI or CT scans	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to recognize need for additional images	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to measure patient's body contours	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to manufacture molds and beam directional shells	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to cut blocks	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to prepare interstitial and intracavity sources	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in taking blood counts, weight, and vital signs	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in maintaining detailed records of therapy sessions	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to set up machines and diagnose problems with equipment	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to advise patients on proper diet and skin care procedures	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to analyze equipment during treatment to ensure delivery of proper dosage	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of machinery and molding process	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to visualize treatment plans in three dimensions	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to conduct particle beam therapy	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	How has the level of this skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	How important is this skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	How important is this skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
skill in suggesting modifications to treatment plans	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to monitor patient response to radiation and refer back to physician instead of continuing treatments, when indicated	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Technical			
ability to apply mathematic concepts:			
basic math skills	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
algebra	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
geometry	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
calculus	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
statistics	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
computer skills			
ability to input data	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of software programs	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to understand computer modeling and simulation	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to write computer programs	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of physical & biological sciences	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of practical psychology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of human anatomy	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

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Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
knowledge of cross-sectional anatomy	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of physiology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of histology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of pathology/disease progression	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of clinical and technical radiation oncology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of radiotherapy, radiobiology, radiation physics	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of basic clinical dosimetry	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of cancer physiology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of nutrition and effects of radiation on digestion	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to understand and translate medical terminology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of medical ethics	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of relevant laws and regulations	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to operate a variety of sophisticated machines	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to respond to medical emergencies	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	How has the level of this skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	How important is this skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	How important is this skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
ability to apply radiation safety procedures	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of hypothermia treatment techniques	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of flouroscopy	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to recognize correct and appropriate physician order/specifications	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Interpersonal/Communicative			
skill in explaining procedure to patient	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in communicating with physician	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to assess patient condition throughout procedure (via monitors, verbal and nonverbal signs)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work as a team member with other imaging professionals	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in communicating with nursing and support staff	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in relieving patient anxiety	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in expressing empathy/relating to patients	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to recognize adverse reactions	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	How has the level of this skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	How important is this skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	How important is this skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
skill in patient care procedures/nursing skills	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to refer patients to other available services	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to counsel patient on diet and hygiene	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
problem-solving skills	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Administrative/Organizational			
ability to interpret physician's orders	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to maintain equipment (upkeep, simple repair, recognition of malfunctions)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to care for patient's medical equipment/support systems	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in keeping detailed records of patients, films, supplies, etc.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to read patient charts and identify necessary preliminary information	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to prepare written reports	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to do detailed work	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

1) What diagnostic procedures do you perform?

2) How many different types of imaging equipment do you operate on your job? ______ What are they?

3) Do you ever make decisions about what image to take or how many images to take? ______ yes ______ no
If yes, under what circumstances?

4) Do you ever make the decision to repeat an image or a procedure because you believe the first one is inaccurate or misleading?

______ yes ______ no

5) Do you read technical/professional journal articles in your field? ______ yes ______ no

6) Do you attend continuing education classes? ______ yes ______ no

7) How frequently are you in contact with the physician (how many times daily)? ____________________

8) What skills or knowledge have you found you needed to perform your job that you did not learn in school?

9) What skills or knowledge in your postsecondary vocational training for this occupation do you never use on your job?

10) What knowledge or skills would you like to acquire that could improve your job performance?

11) What is your job title now? ______________________

What is the title of the person to whom you report? ______________________

12) What kind of facilities do you work in (hospital, independent lab, HMO)? ______________________

13) How long have you been a Radiation Therapy Technologist? ______________________

14) Please list your associate, bachelor, or advanced degrees and any other medical or allied health degrees, certificates, and dates received and where this training was completed.

Allied Health Degree, Certificate, or Diploma (include major)	Institution/State where completed

15) Did you receive counseling about career and advancement opportunities in the medical imaging field? _____ yes _____no

16) What are the current minimum education requirements for entry into your occupation at your organization?

____

____

____

17) Are there license, certificate or other credentials required? If so, what are they?

____

____

18) Is previous work experience in another allied health profession required for entry into your occupation? ______ yes ______ no
If so, which kind of work experience? If not required, what kinds of previous work experience would have been useful to you?

____

____

19) Has the institution where you work encouraged technologists to train in multiple fields? ______ yes ______ no

Is it trying to hire multi-skilled technologists? ______ yes ______ no

20) Career chronology: please list your titles and occupations in the medical imaging field.

Occupation	Title

21) What would you like your next job to be? ____________________

22) What kinds of changes have occurred in your job in the past few years (in job duties, skills, or the way work gets done)?

23) What kinds of changes do you expect will occur in your occupation in the next few years? Why?

NCRVE STUDY OF CHANGING SKILLS AND EDUCATION REQUIREMENTS IN THE HEALTH PROFESSIONS

Diagnostic Ultrasound Technologists

The following is a list that includes skills and abilities you may need to have and types of knowledge that may be important to your job. For each skill, ability, or knowledge, please indicate (1) how the level of knowledge or skill required for your position has changed in the past five years; (2) how important this knowledge or skill is to obtain an entry-level position; and (3) how important this skill or knowledge is for you to advance in your occupation.

	How has the level of this skill or knowledge changed over the past five years?	How important is this skill or knowledge to obtain entry-level job?	How important is this skill or knowledge for advancement?
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Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
Procedural			
skill in preparing patient for exam	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in interpreting medical history for testing implications	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to place gels and transducers on patient properly	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in selecting proper equipment and setting controls	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of correlating technologies (i.e., treadmills, CT, MRI, angiograms)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in recording image in a freezeframe or stripchart mode	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to operate video equipment	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

4.6

4.7

Job skill, ability, or knowledge	How has the level of this skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important **Change in past 5 yrs**	How important is this skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical **How important for entry level?**	How important is this skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical **How important to advance?**
ability to evaluate images for technical quality	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to measure dimensions from images	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to recognize need for additional images	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to use ancillary devices (such as selective transducers, oscilloscope and camera)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to perform calibrations to adjust equipment	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to conduct			
opthamology sonography	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
abdominal sonography	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
neurosonography	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
obstetrical & gynecology sonography	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
adult echocardiography sonography	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
pediatric echocardiography sonography	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
superficial parts sonography	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
vascular sonography	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
peripheral vascular sonography	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to assist in radiation therapy treatment planning	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

Job skill, ability, or knowledge	How has the level of this skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important **Change in past 5 yrs**	How important is this skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical **How important for entry level?**	How important is this skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical **How important to advance?**
Technical			
knowledge of applied basic sciences (chemistry, biology)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to apply mathematical concepts			
basic mathematics	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
algebra	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
geometry	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
calculus	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to understand and interpret medical terminology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of skeletal structure	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of anatomy and physiology			
abdominal anatomy and physiology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
cardiac anatomy and physiology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
vascular anatomy and physiology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
cross-sectional anatomy	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of pathology/disease progression	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of obstetrics, fetal development	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of gynecological disease	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of operating room techniques	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

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Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
knowledge of Doppler techniques			
Doppler physics	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Doppler signal processing	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
application of Doppler techniques	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to perform spectral or waveform Doppler	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to perform echocardiograms	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to perform Duplex imaging	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
computer skills			
ability to input data	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of software programs	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to understand computer simulation	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of the applications and limitations			
of ultrasound technology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
of related diagnostic procedures	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to recognize adverse medical reactions	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to respond to medical emergencies	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in patient care procedures/nursing skills	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to take blood pressure/segmental pressures	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	How has the level of this skill or knowledge changed over the past five years?	How important is this skill or knowledge to obtain entry-level job?	How important is this skill or knowledge for advancement?
	1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
ability to recognize correct and appropriate physician order/specifications	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to make preliminary diagnosis and report information to a physician	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to conduct blood tests	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Interpersonal/Communicative			
skill in explaining procedure to patient	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in communicating with physician	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in communicating with nursing and support staff	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to assess patient condition throughout procedure (observation & communication)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work as a team member with other professionals	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work independently and exercise judgement	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in relieving patient anxiety	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to supervise other staff	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	How has the level of this skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	How important is this skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	How important is this skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
Administrative/Organizational			
ability to interpret physician's orders	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to maintain equipment (upkeep, simple repair, recognition of malfunctions)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of the care/maintenance of patients' medical equipment/support systems	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to keep detailed records of patients, films, supplies, etc.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to prepare written reports	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of medical records systems	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to do detailed work	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

1) What diagnostic procedures do you perform?

2) How many different types of imaging equipment do you operate on your job? ______ What are they?

3) Do you ever make decisions about what image to take or how many images to take? ______ yes ______ no
If yes, under what circumstances?

4) Do you ever make the decision to repeat an image or a procedure because you believe the first one is inaccurate or misleading?

______ yes ______ no

5) Do you read technical/professional journal articles in your field? ______ yes ______ no

6) Do you attend continuing education classes? ______ yes ______ no

4.5 7) How frequently are you in contact with the physician (how many times daily)? ______________________ 4.0

8) What skills or knowledge have you found you needed to perform your job that you did not learn in school?

9) What skills or knowledge in your postsecondary vocational training for this occupation do you never use on your job?

10) What knowledge or skills would you like to acquire that could improve your job performance?

11) What is your job title now? ____________________

What is the title of the person to whom you report? ____________________

12) What kind of facilities do you work in (hospital, independent lab, HMO)? ____________________

13) How long have you been a Diagnostic Ultrasound Technologist? ____________________

14) Please list your associate, bachelor, or advanced degrees and any other medical or allied health degrees, certificates, and dates received and where this training was completed.

Allied Health Degree, Certificate, or Diploma (include major)	Institution/State where completed

15) Did you receive counseling about career and advancement opportunities in the medical imaging field? _____ yes _____ no

16) What are the current minimum education requirements for entry into your occupation at your organization?

____

____

____

17) Are there license, certificate or other credentials required? If so, what are they?

____

____

18) Is previous work experience in another allied health profession required for entry into your occupation? ______ yes ______ no If so, which kind of work experience? If not required, what kinds of previous work experience would have been useful to you?

____

____

19) Has the institution where you work encouraged technologists to train in multiple fields? ______ yes ______ no

Is it trying to hire multi-skilled technologists? ______ yes ______ no

20) Career chronology: please list your titles and occupations in the medical imaging field.

Occupation Title

21) What would you like your next job to be?

22) What kinds of changes have occurred in your job in the past few years (in job duties, skills, or the way work gets done)?

23) What kinds of changes do you expect will occur in your occupation in the next few years? Why?

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NCRVE STUDY OF CHANGING SKILLS AND EDUCATION REQUIREMENTS IN THE HEALTH PROFESSIONS

Magnetic Resonance Imaging Technologists

The following is a list that includes skills and abilities you may need to have and types of knowledge that may be important to your job. For each skill, ability, or knowledge, please indicate (1) how the level of knowledge or skill required for your position has changed in the past five years; (2) how important this knowledge or skill is to obtain an entry-level position; and (3) how important this skill or knowledge is for you to advance in your occupation.

How has the level of this skill or knowledge changed over the past five years?	How important is this skill or knowledge to obtain entry-level job?	How important is this skill or knowledge for advancement?
1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical

Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
Procedural			
ability to prepare patient for exam	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in interpreting medical history for imaging implications	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of patient transfer and positioning	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in MRI equipment set-up and setting controls	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to prepare contrast media	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in taking/developing image	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to interpret basic scan findings	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	How has the level of this skill or knowledge changed over the past five years?	How important is this skill or knowledge to obtain entry-level job?	How important is this skill or knowledge for advancement?
	1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
skill in evaluating images for technical quality	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to recognize need for additional images	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to conduct MR spectroscopy (chemical analysis)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to insert IV	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Technical			
knowledge of basic sciences (chemistry, biology)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to apply mathematical concepts			
basic mathematics	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
algebra	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
geometry	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
calculus	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of physics (properties of magnetism, radio waves)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of human anatomy	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of cross-sectional anatomy	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of functional systems (ex: digestive, cardiovascular)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

Job skill, ability, or knowledge	How has the level of this skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important **Change in past 5 yrs**	How important is this skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical **How important for entry level?**	How important is this skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical **How important to advance?**
knowledge of physiology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of pathology/disease progression	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of the characteristics of normal and abnormal tissue	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to understand and interpret medical terminology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of x-ray technology and procedures	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
computer skills			
ability to input data	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of software programs	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to change formulas within computer procedures	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to comprehend the mechanics, limitations, and applications of MRI technology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to recognize adverse medical reactions	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to respond to medical emergencies	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in patient care procedures/nursing skills	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to recognize correct and appropriate physician order/specifications	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	How has the level of this skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	How important is this skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	How important is this skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
visualization skills	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Interpersonal/Communicative			
skill in explaining procedure to patient	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work with family members who support patient	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in communicating with physician	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to assess patient condition throughout procedure (observation & communication skills)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to recognize and handle adverse psychological reactions (including claustrophobic reactions)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work as a team member with other imaging professionals	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in communicating with nursing and support staff	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in relieving patient anxiety	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work independently and exercise independent judgement	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to supervise other staff	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	How has the level of this skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	How important is this skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	How important is this skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
Administrative/Organizational			
ability to interpret physician's orders	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to ask questions on incomplete order to obtain more complete study	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in keeping detailed records of patients, films, supplies, etc.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to maintain equipment (upkeep, simple repair, recognition of malfunctions)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of the care/maintenance of patients' medical equipment/support systems	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to prepare written reports	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

1) What diagnostic procedures do you perform?

2) How many different types of imaging equipment do you operate on your job? ______ What are they?

3) Do you ever make decisions about what image to take or how many images to take? ______ yes ______ no
If yes, under what circumstances?

4) Do you ever make the decision to repeat an image or a procedure because you believe the first one is inaccurate or misleading?
______ yes ______ no

5) Do you read technical/professional journal articles in your field? ______ yes ______ no

6) Do you attend continuing education classes? ______ yes ______ no

7) How frequently are you in contact with the physician (how many times daily)? ______

8) What skills or knowledge have you found you needed to perform your job that you did not learn in school?

9) What skills or knowledge in your postsecondary vocational training for this occupation do you never use on your job?

10) What knowledge or skills would you like to acquire that could improve your job performance?

11) What is your job title now? ____________________

What is the title of the person to whom you report? ____________________

12) What kind of facilities do you work in (hospital, independent lab, HMO)? ____________________

13) How long have you been a Magnetic Resonance Imaging Technologist? ____________________

14) Please list your associate, bachelor, or advanced degrees and any other medical or allied health degrees, certificates, and dates received and where this training was completed.

Allied Health Degree, Certificate, or Diploma (include major) Institution/State where completed

____

____

____

15) Did you receive counseling about career and advancement opportunities in the medical imaging field? _____ yes _____no

16) What are the current minimum education requirements for entry into your occupation at your organization?

____

____

____

17) Are there license, certificate or other credentials required? If so, what are they?

____

____

18) Is previous work experience in another allied health profession required for entry into your occupation? ______ yes ______ no
If so, which kind of work experience? If not required, what kinds of previous work experience would have been useful to you?

____

____

19) Has the institution where you work encouraged technologists to train in multiple fields? ______ yes ______ no

Is it trying to hire multi-skilled technologists? ______ yes ______ no

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20) Career chronology: please list your titles and occupations in the medical imaging field.

Occupation	Title

21) What would you like your next job to be?

22) What kinds of changes have occurred in your job in the past few years (in job duties, skills, or the way work gets done)?

23) What kinds of changes do you expect will occur in your occupation in the next few years? Why?

NCRVE STUDY OF CHANGING SKILLS AND EDUCATION REQUIREMENTS IN THE HEALTH PROFESSIONS

Diagnostic Radiation Technologist

The following is a list that includes skills and abilities you may need to have and types of knowledge that may be important to your job. For each skill, ability, or knowledge, please indicate (1) how the level of knowledge or skill required for your position has changed in the past five years; (2) how important this knowledge or skill is to obtain an entry-level position; and (3) how important this skill or knowledge is for you to advance in your occupation.

How has the level of this skill or knowledge changed over the past five years?	How important is this skill or knowledge to obtain entry-level job?	How important is this skill or knowledge for advancement?
1 = no longer important	1 = not at all important	1 = not at all important
2 = less important now	2 = of minor importance	2 = of minor importance
3 = no change	3 = important	3 = important
4 = more important now	4 = very important	4 = very important
5 = much more important	5 = critical	5 = critical

Job skill, ability, or knowledge	Change in past 5 yrs	How important for entry level?	How important to advance?
Procedural			
skill in preparing patient for exam	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of patient transfer and positioning	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in positioning x-ray equipment and setting controls	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in shielding patient organs	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in manipulation of beam	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to properly record images	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to apply radiographic exposure techniques	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to develop image	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	How has the level of this skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	How important is this skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	How important is this skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
ability to prepare contrast mediums	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in administering contrast mediums to patients	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in recognizing abnormalities and artifacts within the recorded image	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in evaluating images for technical quality	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to recognize need for additional images	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to assist in flouroscopy studies	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to assist in cardiovascular studies	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Technical			
ability to apply mathematical concepts			
basic mathematics	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
algebra	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
geometry	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
calculus	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
statistics	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of basic sciences (chemistry, biology)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	How has the level of this skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	How important is this skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	How important is this skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
knowledge of basic physics (concepts of energy, electric power/circuits, properties of x-rays)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of human anatomy	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of cross-sectional anatomy	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of functional systems (ex: digestive, cardiovascular)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of physiology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of pathology/disease progression	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to understand and interpret medical terminology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of sterile technique	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
computer skills			
keyboard skills	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
software programs	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
programming	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of radiobiology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of radiation protection standards and practices	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of radiopharmacology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	How has the level of this skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	How important is this skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	How important is this skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
knowledge of medical ethics	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to recognize adverse medical reactions	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to respond to medical emergencies	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in patient care procedures/nursing skills	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to recognize correct and appropriate physician order/specifications	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Interpersonal/Communicative			
skill in explaining procedure to patient	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in communicating with physician	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work independently and exercise judgement	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to assess patient condition throughout procedure (observation & communication skills)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work as a team member with other imaging professionals	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in relieving patient anxiety	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to supervise other staff	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	How has the level of this skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	How important is this skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	How important is this skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
Administrative/Organizational			
ability to interpret physician's orders	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in loading film/changing chemicals	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to maintain equipment (upkeep, simple repair, recognition of malfunctions)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of the care/maintenance of patients' medical equipment/support systems	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in keeping detailed records of patients, films, supplies, etc.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to perform purchasing tasks (of supplies, etc.)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to prepare written reports	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

1) What diagnostic procedures do you perform?

________________________________ ________________________________

________________________________ ________________________________

________________________________ ________________________________

________________________________ ________________________________

2) How many different types of imaging equipment do you operate on your job? ______ What are they?

________________________________ ________________________________

________________________________ ________________________________

________________________________ ________________________________

________________________________ ________________________________

3) Do you ever make decisions about what image to take or how many images to take? ______ yes ______ no
If yes, under what circumstances?

____

____

____

4) Do you ever make the decision to repeat an image or a procedure because you believe the first one is inaccurate or misleading?

______ yes ______ no

5) Do you read technical/professional journal articles in your field? ______ yes ______ no

6) Do you attend continuing education classes? ______ yes ______ no

7) How frequently are you in contact with the physician (how many times daily)? ________________________

8) What skills or knowledge have you found you needed to perform your job that you did not learn in school?

9) What skills or knowledge in your postsecondary vocational training for this occupation do you never use on your job?

10) What knowledge or skills would you like to acquire that could improve your job performance?

11) What is your job title now? ______

What is the title of the person to whom you report? ______

12) What kind of facilities do you work in (hospital, independent lab, HMO)? ______

13) How long have you been a Diagnostic Radiation Technologist? ______

14) Please list your associate, bachelor, or advanced degrees and any other medical or allied health degrees, certificates, and dates received and where this training was completed.

Allied Health Degree, Certificate, or Diploma (include major)	Institution/State where completed

15) Did you receive counseling about career and advancement opportunities in the medical imaging field? _____ yes _____ no

16) What are the current minimum education requirements for entry into your occupation at your organization?

____

____

____

17) Are there license, certificate or other credentials required? If so, what are they?

____

____

18) Is previous work experience in another allied health profession required for entry into your occupation? ______ yes ______ no
If so, which kind of work experience? If not required, what kinds of previous work experience would have been useful to you?

____

____

468 19) Has the institution where you work encouraged technologists to train in multiple fields? ______ yes ______ no 469

Is it trying to hire multi-skilled technologists? ______ yes ______ no

20) Career chronology: please list your titles and occupations in the medical imaging field.

Occupation	Title

21) What would you like your next job to be? ____________________

22) What kinds of changes have occurred in your job in the past few years (in job duties, skills, or the way work gets done)?

23) What kinds of changes do you expect will occur in your occupation in the next few years? Why?

NCRVE STUDY OF CHANGING SKILLS AND EDUCATION REQUIREMENTS IN THE HEALTH PROFESSIONS

Nuclear Medicine Technologist

The following is a list that includes skills and abilities you may need to have and types of knowledge that may be important to your job. For each skill, ability, or knowledge, please indicate (1) how the level of knowledge or skill required for your position has changed in the past five years; (2) how important this knowledge or skill is to obtain an entry-level position; and (3) how important this skill or knowledge is for you to advance in your occupation.

How has the level of this skill or knowledge changed over the past five years?	How important is this skill or knowledge to obtain entry-level job?	How important is this skill or knowledge for advancement?
1 = no longer important	1 = not at all important	1 = not at all important
2 = less important now	2 = of minor importance	2 = of minor importance
3 = no change	3 = important	3 = important
4 = more important now	4 = very important	4 = very important
5 = much more important	5 = critical	5 = critical

Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
Procedural			
skill in preparing patient for exam	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of patient transfer and positioning	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to interpret medical history for imaging implications	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to check equipment, ensuring proper functioning	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to prepare/measure radio-pharmaceuticals	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in administration of radio-pharmaceuticals	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in positioning equipment and setting controls	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	How has the level of this skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	How important is this skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	How important is this skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
skill in shielding patient organs	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to record images properly	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to develop image	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in evaluating images for technical quality	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to recognize need for additional images	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of standard protocols for various exams	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of proper handling and disposal of radioactive substances	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Technical			
ability to apply mathematical concepts			
basic math skills (volume, percentages, half-lives)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
algebra	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
calculus	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
statistics	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
computer skills			
ability to input data	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of software programs	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to change formulas within computer procedures	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	How has the level of this skill or knowledge changed over the past five years?	How important is this skill or knowledge to obtain entry-level job?	How important is this skill or knowledge for advancement?
	1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
knowledge of basic sciences (chemistry, biology)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of human anatomy	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of cross-sectional anatomy	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of functional systems (cardiac, skeletal, glandular)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of physiology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of pathology/disease progression	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of electronics	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to understand and translate medical terminology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of radiation physics, isotopic energies, and radioactive decay	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to apply clinical lab techniques (dilution, pipetting, injection, blood and urine sampling)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of radiopharmaceuticals	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of procedures for radioactive spills, contamination, and exposure	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	How has the level of this skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	How important is this skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	How important is this skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
knowledge of the biological effects of radiation exposure	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to recognize adverse medical reactions	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to respond to medical emergencies	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in patient care procedures/nursing skills	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to recognize correct and appropriate physician specifications (substance, amount, concentration, etc.)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Interpersonal/Communicative			
skill in explaining procedure to patients	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in communicating with physician	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to assess patient condition throughout procedure (observation & communication)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work as a team member with other imaging professionals	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in communicating with nursing and support staff	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in relieving patient anxiety	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work independently and exercise judgement	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

How has the level of this skill or knowledge changed over the past five years?	How important is this skill or knowledge to obtain entry-level job?	How important is this skill or knowledge for advancement?
1 = no longer important	1 = not at all important	1 = not at all important
2 = less important now	2 = of minor importance	2 = of minor importance
3 = no change	3 = important	3 = important
4 = more important now	4 = very important	4 = very important
5 = much more important	5 = critical	5 = critical

Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
ability to supervise other staff	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Administrative/Organizational			
ability to interpret physician's orders	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to maintain equipment (upkeep, simple repair, recognition of malfunctions)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of the care/maintenance of patients' medical equipment/support systems	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to perform purchasing tasks (i.e., inventory, ordering)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in keeping detailed records of patients, procedures, and reaction	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to prepare written reports	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in keeping detailed records of inventory, use, and disposal of radioactive materials	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to monitor radiation (incl. use of Geiger counter)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of procedures and regulations concerning handling, testing, disposing, and reporting of radioactive materials	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

1) What diagnostic procedures do you perform?

2) How many different types of imaging equipment do you operate on your job? _______ What are they?

3) Do you ever make decisions about what image to take or how many images to take? ______ yes ______ no
If yes, under what circumstances?

4) Do you ever make the decision to repeat an image or a procedure because you believe the first one is inaccurate or misleading?

______ yes ______ no

5) Do you read technical/professional journal articles in your field? ______ yes ______ no

6) Do you attend continuing education classes? ______ yes ______ no

7) How frequently are you in contact with the physician (how many times daily)? ______________________

8) What skills or knowledge have you found you needed to perform your job that you did not learn in school?

9) What skills or knowledge in your postsecondary vocational training for this occupation do you never use on your job?

10) What knowledge or skills would you like to acquire that could improve your job performance?

11) What is your job title now? ______

What is the title of the person to whom you report? ______

12) What kind of facilities do you work in (hospital, independent lab, HMO)? ______

13) How long have you been a Nuclear Medicine Technologist? ______

14) Please list your associate, bachelor, or advanced degrees and any other medical or allied health degrees, certificates, and dates received and where this training was completed.

Allied Health Degree, Certificate, or Diploma (include major)	Institution/State where completed

15) Did you receive counseling about career and advancement opportunities in the medical imaging field? _____ yes _____no

16) What are the current minimum education requirements for entry into your occupation at your organization?

____

____

____

17) Are there license, certificate or other credentials required? If so, what are they?

____

____

18) Is previous work experience in another allied health profession required for entry into your occupation? ______ yes ______ no
If so, which kind of work experience? If not required, what kinds of previous work experience would have been useful to you?

____

____

19) Has the institution where you work encouraged technologists to train in multiple fields? ______ yes ______ no

Is it trying to hire multi-skilled technologists? ______ yes ______ no

20) Career chronology: please list your titles and occupations in the medical imaging field.

Occupation Title

21) What would you like your next job to be?

22) What kinds of changes have occurred in your job in the past few years (in job duties, skills, or the way work gets done)?

23) What kinds of changes do you expect will occur in your occupation in the next few years? Why?

NCRVE STUDY OF CHANGING SKILLS AND EDUCATION REQUIREMENTS IN THE HEALTH PROFESSIONS

EKG Technicians

The following is a list that includes skills and abilities you may need to have and types of knowledge that may be important to your job. For each skill, ability, or knowledge, please indicate (1) how the level of knowledge or skill required for your position has changed in the past five years; (2) how important this knowledge or skill is to obtain an entry-level position; and (3) how important this skill or knowledge is for you to advance in your occupation.

How has the level of this skill or knowledge changed over the past five years?	How important is this skill or knowledge to obtain entry-level job?	How important is this skill or knowledge for advancement?
1 = no longer important	1 = not at all important	1 = not at all important
2 = less important now	2 = of minor importance	2 = of minor importance
3 = no change	3 = important	3 = important
4 = more important now	4 = very important	4 = very important
5 = much more important	5 = critical	5 = critical

Job skill, ability, or knowledge	Change in past 5 yrs	How important for entry level?	How important to advance?
Procedural			
skill in placing and relocating electrodes	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in operating the machinery	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to carry out holter monitoring	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to conduct stress testing	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in performing vectorcardiograms (multi-dimensional tracings)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to monitor EKG results	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to recognize and correct any technical errors and other interferences	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	How has the level of this skill or knowledge changed over the past five years?	How important is this skill or knowledge to obtain entry-level job?	How important is this skill or knowledge for advancement?
	1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
skill in noting sections of the test which the physician should review	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in assisting with cardiac catheterization	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in assisting with thalium radionuclei studies	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Technical			
knowledge of heart disease	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of cardiac functions and rhythms, both normal and abnormal	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of electricity	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of electronics	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of echocardiography	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to use computer equipment	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to take blood pressure	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in monitoring heart rate	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	How has the level of this skill or knowledge changed over the past five years?	How important is this skill or knowledge to obtain entry-level job?	How important is this skill or knowledge for advancement?
	1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical

Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
knowledge of medications that could affect tests	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of body mechanics and leverage techniques	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to apply mathematical concepts			
basic mathematics	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
algebra	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
geometry	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
calculus	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of basic sciences (chemistry, biology)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of physiology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of medical terminology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of human anatomy	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to perform CPR	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to type	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to handle medical emergencies	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

Job skill, ability, or knowledge	Change in past 5 yrs	How important for entry level?	How important to advance?
	How has the level of this skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	How important is this skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	How important is this skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Interpersonal/Communicative			
skill in explaining procedure to patient	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to take client history	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in relaxing the patient	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in communicating with physician	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work independently and to exercise judgement	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in assessing patient condition throughout procedure and to recognize adverse reactions	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to apply patient care procedures/nursing skills	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in expressing empathy and relating to patients	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work as a team member with other professionals	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to supervise other staff	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to communicate with nursing and support staff	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	How has the level of this skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	How important is this skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	How important is this skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
Administrative/Organizational			
ability to interpret physician's orders	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in equipment maintenance (upkeep, simple repair/adjustments, recognition of malfunction)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to care for patients' medical equipment/support systems	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to keep detailed records of patients, test outcomes, supplies, etc.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of medical office/hospital record keeping	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to prepare written reports	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in preparing report for physician review	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to follow detailed instructions	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

1) What diagnostic procedures do you perform?

2) How many different types of imaging equipment do you operate on your job? ______ What are they?

3) Do you ever make decisions about what image to take or how many images to take? ______ yes ______ no
If yes, under what circumstances?

4) Do you ever make the decision to repeat an image or a procedure because you believe the first one is inaccurate or misleading?

______ yes ______ no

5) Do you read technical/professional journal articles in your field? ______ yes ______ no

6) Do you attend continuing education classes? ______ yes ______ no

7) How frequently are you in contact with the physician (how many times daily)? ______________________

8) What skills or knowledge have you found you needed to perform your job that you did not learn in school?

____

____

____

9) What skills or knowledge in your postsecondary vocational training for this occupation do you never use on your job?

____

____

____

10) What knowledge or skills would you like to acquire that could improve your job performance?

____

____

____

11) What is your job title now? ______________________________

What is the title of the person to whom you report? ______________________________

12) What kind of facilities do you work in (hospital, independent lab, HMO)? ______________________________

13) How long have you been an EKG Technician? ______________________________

14) Please list your associate, bachelor, or advanced degrees and any other medical or allied health degrees, certificates, and dates received and where this training was completed.

Allied Health Degree, Certificate, or Diploma (include major)	Institution/State where completed

15) Did you receive counseling about career and advancement opportunities in the medical imaging field? _____ yes _____ no

16) What are the current minimum education requirements for entry into your occupation at your organization?

____

____

____

17) Are there license, certificate or other credentials required? If so, what are they?

____

____

18) Is previous work experience in another allied health profession required for entry into your occupation? ______ yes ______ no
If so, which kind of work experience? If not required, what kinds of previous work experience would have been useful to you?

____

____

5 4 19) Has the institution where you work encouraged technologists to train in multiple fields? ______ yes ______ no 5 5

Is it trying to hire multi-skilled technologists? ______ yes ______ no

20) Career chronology: please list your titles and occupations in the medical imaging field.

Occupation	Title

21) What would you like your next job to be? ____________________

22) What kinds of changes have occurred in your job in the past few years (in job duties, skills, or the way work gets done)?

23) What kinds of changes do you expect will occur in your occupation in the next few years? Why?

NCRVE STUDY OF CHANGING SKILLS AND EDUCATION REQUIREMENTS IN THE HEALTH PROFESSIONS

Physical Therapy Assistant

The following is a list that includes skills and abilities you may need to have and types of knowledge that may be important to your job. For each skill, ability, or knowledge, please indicate (1) how the level of knowledge or skill required for your position has changed in the past five years; (2) how important this knowledge or skill is to obtain an entry-level position; and (3) how important this skill or knowledge is for you to advance in your occupation.

How has the level of this skill or knowledge changed over the past five years?	How important is this skill or knowledge to obtain entry-level job?	How important is this skill or knowledge for advancement?
1 = no longer important	1 = not at all important	1 = not at all important
2 = less important now	2 = of minor importance	2 = of minor importance
3 = no change	3 = important	3 = important
4 = more important now	4 = very important	4 = very important
5 = much more important	5 = critical	5 = critical

Job skill, ability, or knowledge	**Change in the past 5 yrs**	**How important for entry level?**	**How important to advance?**
Assessment and Diagnosis			
Ability to take patient history	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of questions to ask for an accurate medical history	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to assess patient symptoms to diagnosis injury or illness	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Skill in analyzing patient symptoms and responses to therapy	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to recognize illness or injury requiring medical treatment	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to conduct manual tests of strength and range of motion	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to conduct manual tests for condition of tissues and joints	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to execute physician's prescribed treatment plan	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to execute physical therapist's treatment plan	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of which tests are appropriate for each patient	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

JOB KNOWLEDGE AND SKILLS SURVEY

How has the level of this skill or knowledge changed over the past five years?	How important is this skill or knowledge to obtain entry-level job?	How important is this skill or knowledge for advancement?
1 = no longer important	1 = not at all important	1 = not at all important
2 = less important now	2 = of minor importance	2 = of minor importance
3 = no change	3 = important	3 = important
4 = more important now	4 = very important	4 = very important
5 = much more important	5 = critical	5 = critical

Job skill, ability, or knowledge	**Change in the past 5 yrs**	**How important for entry level?**	**How important to advance?**
Ability to choose modality or treatment procedure based on therapist's diagnosis	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Treatment			
Ability to assess whether patient is responding to treatment	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to identify when a treatment plan must be changed	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to modify a treatment plan	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to develop an at-home treatment and exercise plan	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to teach patient how to execute at-home exercise plan	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to record treatment and patients' responses	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of the best modalities to treat each injury or disease	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of expected response to specific treatments	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of therapeutic exercises appropriate for different illness, injury, or disease	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to choose modalities and treatments (independent of the therapist) based on diagnosis	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Skill in applying diathermia	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Skill in applying hydrotherapy	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Skill in apply hot and cold packs	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

JOB KNOWLEDGE AND SKILLS SURVEY

	How has the level of this skill or knowledge changed over the past five years?	How important is this skill or knowledge to obtain entry-level job?	How important is this skill or knowledge for advancement?
	1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in the past 5 yrs**	**How important for entry level?**	**How important to advance?**
Skill in applying traction	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Skill in teaching patients to regain mobility (gait training, transfer training, ambulation)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Skill in applying manual manipulation techniques	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Skill in applying massage techniques	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Skill in applying electric stimulation	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Skill in applying therapeutic ultrasound	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to work with post-surgical patients	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to work with medical patients (e.g., stroke)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of neck and back injuries and treatment	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of geriatrics and therapies for elder individuals	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of sports medicine	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of orthopedics	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of occupational therapy	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Basic Knowledge and Ability			
Knowledge of physiology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of neurology related to muscle function	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

JOB KNOWLEDGE AND SKILLS SURVEY

How has the level of this skill or knowledge changed over the past five years?	How important is this skill or knowledge to obtain entry-level job?	How important is this skill or knowledge for advancement?
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Job skill, ability, or knowledge	**Change in the past 5 yrs**	**How important for entry level?**	**How important to advance?**
Knowledge of muscular anatomy	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of skeletal anatomy	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of other anatomy (organs, circulatory systems, etc)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of pharmacology (for planning treatments)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of disease process and effect on body functions	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of cardiac functioning, conditions, and functioning	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of kinesiology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of basic physics	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of the normal range of motion	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of the principals of electricity	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Skill in problem-solving	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to accurately complete mathematic calculations	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to provide patient care	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Physical strength to lift and move patients	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Administrative and communication			
Ability to work without constant supervision by a physical therapist	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

JOB KNOWLEDGE AND SKILLS SURVEY

How has the level of this skill or knowledge changed over the past five years?	How important is this skill or knowledge to obtain entry-level job?	How important is this skill or knowledge for advancement?
1 = no longer important	1 = not at all important	1 = not at all important
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5 = much more important	5 = critical	5 = critical

Job skill, ability, or knowledge	**Change in the past 5 yrs**	**How important for entry level?**	**How important to advance?**
Ability to assist in training of new physical therapy assistants or students	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to supervise aides and clerical staff	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to be assertive with patients and physicians	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of how to communicate with physicians verbally and in writing on patient's progress	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of how to communicate with physical therapists verbally and in writing on patient's progress	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Skills in communicating with the patients	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of basic sociology and psychology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Understanding of the legal and ethical parameters of practice	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Written communication skills ability to write in prose (such as memos and reports)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of medical terminology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of third party payer rules for reimbursement	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

1) What modalities (types of therapy) do you use?

2) How many different types of therapy equipment do you operate on your job? ______ What are they?

3) Do you read technical/professional journal articles in your field? ______ yes ______ no

4) Do you attend continuing education classes? ______ yes ______ no

5) How frequently are you in contact with physicians? ______

6) What skills or knowledge have you found you needed to perform your job that you did not learn in school?

7) What skills or knowledge in your postsecondary vocational training for this occupation do you never use on your job?

8) Did you receive counseling about career and advancement opportunities for physical therapy assistants? _____ yes _____no

9) What knowledge or skills would you like to acquire that could improve your job performance?

10) What is your job title now? ____________________

What is the title of the person to whom you report? ____________________

11) What kind of facilities do you work in (hospital, independent facility, HMO)? ____________________

12) How long have you been a physical therapy assistant?____________________

13) Please list your associate, bachelor, or advanced degrees and any other medical or allied health degrees or certificates, and dates received and where this training was completed.

Health Degree, Certificate, or Diploma (include major)	Date	Institution/State where completed

14) What are the current minimum education requirements for entry into your occupation at your organization?

15) Are there license, certificate or other credentials required? If so, what are they?

16) Is previous work experience in another allied health profession required for entry into your occupation? ______ yes ______ no
If so, which kind of work experience? If not required, what kinds of previous work experience would have been useful to you?

17) Career chronology: please list your titles and occupations in the medical and health care fields, with the most recent first.

Occupation	Title

18) What would you like your next job to be? ______________________________

19) Do you plan to pursue a career as a physical therapist in the future? _____ yes _____ no

20) What kinds of changes have occurred in your job in the past few years (in job duties, skills, or the way work gets done)?

21) What kinds of changes do you expect will occur in your occupation in the next few years? Why?

NCRVE STUDY OF CHANGING SKILLS AND EDUCATION REQUIREMENTS IN THE HEALTH PROFESSIONS

Physical Therapist

The following is a list that includes skills and abilities you may need to have and types of knowledge that may be important to your job. For each skill, ability, or knowledge, please indicate (1) how the level of knowledge or skill required for your position has changed in the past five years; (2) how important this knowledge or skill is to obtain an entry-level position; and (3) how important this skill or knowledge is for you to advance in your occupation.

How has the level of this skill or knowledge changed over the past five years?	How important is this skill or knowledge to obtain entry-level job?	How important is this skill or knowledge for advancement?
1 = no longer important	1 = not at all important	1 = not at all important
2 = less important now	2 = of minor importance	2 = of minor importance
3 = no change	3 = important	3 = important
4 = more important now	4 = very important	4 = very important
5 = much more important	5 = critical	5 = critical

Job skill, ability, or knowledge	**Change in the past 5 yrs**	**How important for entry level?**	**How important to advance?**
Assessment and Diagnosis			
Ability to take patient history	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to assess patient symptoms to diagnosis injury or illness	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of questions to ask for an accurate medical history	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to recognize illness or injury requiring medical treatment	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to conduct manual tests of strength and range of motion	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to conduct manual tests for condition of tissues and joints	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to develop an appropriate treatment plan	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to execute physician's prescribed treatment plan	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of which tests are appropriate for each patient	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Testing of systems (e.g., pulmonary, neurological, metabolic)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	How has the level of this skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	How important is this skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	How important is this skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in the past 5 yrs**	**How important for entry level?**	**How important to advance?**
Treatment			
Ability to assess whether patient is responding to treatment	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to develop an at-home treatment and exercise plan	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to teach patients at-home treatment and exercises	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to record treatment and patients' responses	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of the best modalities to treat each injury or disease	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of expected response to specific treatments	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Skill in analyzing patient symptoms and responses to therapy	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of theraputic exercises appropriate for different illness, injury, or disease	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Skill in applying diathermia	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Skill in applying hydrotherapy	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Skill in applying therapeutic ultrasound	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Skill in applying therapeutic heat and cold	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Skill in applying traction	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Skill in teaching patients to regain mobility (gait training, transfer training, ambulation)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	How has the level of this skill or knowledge changed over the past five years?	How important is this skill or knowledge to obtain entry-level job?	How important is this skill or knowledge for advancement?
	1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in the past 5 yrs**	**How important for entry level?**	**How important to advance?**
Skill in applying manual manipulation techniques	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Skill in applying massage techniques	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Skill in applying electric stimulation	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Skill in applying external dressings and supports	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Skill in the administration of ultraviolet	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Skill in applying intermittent venous compression	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to identify/recommend solutions for architectural barriers	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to work with post-surgical patients	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to work with medical patients (e.g., stroke)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to conduct goniometric measurement	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of neck and back injuries and treatment	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of geriatrics and therapies for elder individuals	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of sports medicine	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of occupational therapy	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

Job skill, ability, or knowledge	How has the level of this skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important **Change in the past 5 yrs**	How important is this skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical **How important for entry level?**	How important is this skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical **How important to advance?**
Basic Knowledge			
Knowledge of physiology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of neurology related to muscle function	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of muscular anatomy	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of skeletal anatomy	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of other anatomy (organs, circulatory systems, etc)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of pharmacology (for planning treatments)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of disease process and effects on body functions	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of cardiac functioning, conditions, and functioning	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of kinesiology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of the normal range of motion	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of the principals of electricity	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of physics	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Skill in problem-solving	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to accurately complete mathematic calculations	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to provide patient care	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Physical strength to lift and maneuver patients	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	How has the level of this skill or knowledge changed over the past five years?	How important is this skill or knowledge to obtain entry-level job?	How important is this skill or knowledge for advancement?
	1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in the past 5 yrs**	**How important for entry level?**	**How important to advance?**
Administrative and communication			
Ability to supervise physical therapy assistants	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to train physical therapists	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to train assistants	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to supervise aides and clerical staff	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to work as a team member with other health professionals	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to work independent of supervision	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Ability to be assertive with patients and physicians	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of how to communicate with physicians verbally and in writing on patient's progress	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Skills in communicating with the patients	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of basic sociology and psychology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Written communication skills (ability to write memos and reports)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of medical terminology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Understanding of the legal and ethical parameters of practice	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of small business administration	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge of third party payer rules for reimbursement	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

1) What modalities (types of therapy) do you use?

____

____

____

2) How many different types of therapy equipment do you operate on your job? ______ What are they?

____

____

____

3) Do you read technical/professional journal articles in your field? ______ yes ______ no

4) Do you attend continuing education classes? ______ yes ______ no

5) How frequently are you in contact with physicians? ______________________________

6) Did your education provide you with sufficient:

hands on lab work ______ yes ______ no
neurological training ______ yes ______ no
training to deal with trama ______ yes ______ no
training in the use of new equipment ______ yes ______ no

7) What skills or knowledge have you found you needed to perform your job that you did not learn in school?

____

____

____

8) What skills or knowledge in your postsecondary training for this occupation do you *never* use on your job?

9) What knowledge or skills would you like to acquire that could improve your job performance?

10) What is your job title now? ____

What is the title of the person to whom you report? ____

11) What kind of facility do you work in now (hospital, independent facility, HMO)? ____

12) In what kind of facility was your first job as a therapist? ____

13) How long have you been a physical therapist? ____

14) Please list your associate, bachelor, or advanced degrees and any other medical or allied health degrees or certificates, and dates received and where this training was completed.

Health Degree, Certificate, or Diploma (including major)	Date	Institution/State where completed

15) What are the current minimum education requirements for entry into your occupation at your institution or firm?

____

____

____

16) Are there license, certificate, or other credentials required? If so, what are they?

____

____

17) Is previous work experience in another allied health profession required for entry into your occupation? ______ yes ______ no
If so, which kind of work experience? If not required, what kinds of previous work experience would have been useful to you?

____

____

____

____

18) Career chronology: please list your titles and occupations in the medical and health care fields, with the most recent first.

Occupation	Title	Type of Institution (hospital, SNF, HMO, clinic, private practice, other)

19) What would you like your next job to be? ______________________________

20) What kinds of changes have occurred in your job in the past few years (in job duties, skills, or the way work gets done)?

____

____

____

____

____

21) What kinds of changes do you expect will occur in your occupation in the next few years? Why?

____

____

____

____

____

____

JOB KNOWLEDGE AND SKILLS SURVEY

Respiratory Therapists

The following is a list that includes skills and abilities you may need to have and types of knowledge that may be important to your job. For each skill, ability, or knowledge, please indicate (1) how the level of knowledge or skill required for your position has changed in the past five years; (2) how important this knowledge or skill is to obtain an entry-level position; and (3) how important this skill or knowledge is for you to advance from your current position.

How has the level of this skill or knowledge changed over the past five years?	How important is this skill or knowledge to obtain entry-level job?	How important is this skill or knowledge for advancement?
1 = no longer important	1 = not at all important	1 = not at all important
2 = less important now	2 = of minor importance	2 = of minor importance
3 = no change	3 = important	3 = important
4 = more important now	4 = very important	4 = very important
5 = much more important	5 = critical	5 = critical

Job skill, ability, or knowledge	**Change in the past 5 yrs**	**How important for entry level?**	**How important to advance?**
Assessment and Diagnosis			
ability to read and interpret reports on patients from prior shifts of respiratory therapists	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in monitoring the patient's heart rate, breath sounds, and general appearance	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to read and interpret heart and respiratory monitors	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to interpret implications of vital signs for treatment	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to assess patients' condition based on exam and tests	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to take arterial blood samples	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to conduct blood gas analysis	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to calibrate blood gas analyzer machines	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

Job skill, ability, or knowledge	How has the level of this skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important **Change in the past 5 yrs**	How important is this skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical **How important for entry level?**	How important is this skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical **How important to advance?**
knowledge of normal blood gas content and pH	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to conduct pulmonary screening exams	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Treatment			
knowledge of hospital respiratory care routines and procedures	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to fill physician's orders for treatment	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to determine if physician's orders are appropriate	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in intubation	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of how to operate different ventilators	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to use digitalized ventilators	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of how ventilators assist patients breathing	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to determine the most appropriate ventilator for a patient	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of what effect ventilators should have on the patient	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in administering oxygen therapy (masks)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of how to set oxygen flow rates	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of set inspiratory and expiratory rates	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to use pressure support ventilator	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in nasal ventilation	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

Job skill, ability, or knowledge	How has the level of this skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important **Change in the past 5 yrs**	How important is this skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical **How important for entry level?**	How important is this skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical **How important to advance?**
skill in high frequency jet ventilation	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to determine when to take patient off respirator	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in Intermittent Positive Pressure Breathing	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to administer aerosol drugs	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in using a nebulizer	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in bronchodilator therapy	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to identify potential drug interactions with adverse responses before administering drugs	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in suctioning patients	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in assisting with bronchoscopy	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to function as a hemodynamic assistant	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to conduct cardiac treadmill tests	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to perform cardiac catheterization	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to conduct EKG	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to conduct echocardiograms	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to conduct procedure to wean patients from respirators	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to assess when a physician needs to be called	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to describe a patient's condition to the physician	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	How has the level of this skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	How important is this skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	How important is this skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in the past 5 yrs**	**How important for entry level?**	**How important to advance?**
skill in responding to cardiac arrest with resuscitation equipment	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to ventilate the patient with a manual resuscitator bag	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in postural draining	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in physiotherapy	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to administer respiratory care during patient transport	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work in critical care	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work in surgery	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work in the emergency room	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work general hospital floor	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work in home care setting	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in neonatal intensive care	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in pediatric intensive care	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in pulmonary rehabilitation	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in equipment set up and maintenance	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
General Knowledge			
knowledge of chemistry	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of human physiology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

How has the level of this skill or knowledge changed over the past five years?	How important is this skill or knowledge to obtain entry-level job?	How important is this skill or knowledge for advancement?
1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical

Job skill, ability, or knowledge	**Change in the past 5 yrs**	**How important for entry level?**	**How important to advance?**
knowledge of human anatomy	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of pharmacology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of cardiopulmonary anatomy	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of respiratory physiology and anatomy	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of microbiology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of pulmonary disease	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of pathology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of blood chemistry	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of physics	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of statistics and statistical analysis	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to apply anatomy and physiology to assess patient condition	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of how patients respond to life support	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to conduct algebraic calculations on hand calculators	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skills in computer utilization	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skills in computer programming	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Communication and administrative skills			
ability to describe treatments to patients	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

Job skill, ability, or knowledge	How has the level of this skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important **Change in the past 5 yrs**	How important is this skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical **How important for entry level?**	How important is this skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical **How important to advance?**
ability to develop relationship with patients	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to communicate with other therapists	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to be assertive with physicians and nurses	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to make quick decisions during crises	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to accurately record treatments and patient's condition	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to pay attention to detail in monitoring patients and keeping records	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to communicate with patients who cannot speak	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to be patient during difficult and lengthy procedures	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of hospital record-keeping procedures	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to organize time efficiently and keep to schedules	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to supervise other staff	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to write in prose (such as memos and reports)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of medical terminology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of third-party payer rules for reimbursement	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

1) What respiratory care procedures do you perform?

2) How many different types of respiratory care equipment do you operate on your job? ______ What are they?

3) Do you make the decisions about what equipment or respiratory care procedure to use (or do the physicians generally decide)?
______ yes ______ no

If yes, under what circumstances?

4) Do you read technical/professional journal articles in your field? ______ yes ______ no

5) Do you attend continuing education classes? ______ yes ______ no

6) How frequently are you in contact with physicians (how many times daily)? ____________________

7) How frequently are you contract with nurses? ____________________

8) What types of respiratory care duties does the nursing staff in your facility usually perform?

9) What skills or knowledge have you found you needed to perform your job that you did not learn in school?

10) What skills or knowledge in your postsecondary vocational training for this occupation do you never use on your job?

11) What knowledge or skills would you like to acquire that could improve your job performance?

12) What is your job title now? ____________________

What is the title of the person to whom you report? ____________________

13) What kind of facilities do you work in (hospital, home health, HMO)? ______________________________

14) How long have you been a respiratory therapist? ______________________________

15) Please list your associate, bachelor, or advanced degrees and any other medical or allied health degrees, certificates, and dates received and where this training was completed.

Allied Health Degree, Certificate, or Diploma	Date	Institution/State where completed

16) What are the current minimum education requirements for entry into your occupation at your organization?

____

____

____

17) Are there license, certificate or other credentials required? If so, what are they?

____

____

____

18) Is previous work experience in another allied health profession required for entry into your occupation? _____ yes _____ no

If so, which kind of work experience? If not required, what kinds of previous work experience would have been useful to you?

19) Career chronology: please list your titles and occupations in the medical and health care fields.

Occupation	Title

20) What would you like your next job to be? ____________________

21) What kinds of changes have occurred in your job in the past few years (in job duties, skills, or the way work gets done)?

22) What kinds of changes do you expect will occur in your occupation in the next few years? Why?

NCRVE STUDY OF CHANGING SKILLS AND EDUCATION REQUIREMENTS IN THE HEALTH PROFESSIONS

Medical Records Clerk

The following is a list that includes skills and abilities you may need to have and types of knowledge that may be important to your job. For each skill, ability, or knowledge, please indicate (1) how the level of knowledge or skill required for your position has changed in the past five years; (2) how important this knowledge or skill is to obtain an entry-level position; and (3) how important this skill or knowledge is for you to advance in your occupation.

How has the level of this skill or knowledge changed over the past five years?	How important is this skill or knowledge to obtain entry-level job?	How important is this skill or knowledge for advancement?
1 = no longer important	1 = not at all important	1 = not at all important
2 = less important now	2 = of minor importance	2 = of minor importance
3 = no change	3 = important	3 = important
4 = more important now	4 = very important	4 = very important
5 = much more important	5 = critical	5 = critical

Job skill, ability, or knowledge	Change in past 5 yrs	How important for entry level?	How important to advance?
Clerical Procedures			
ability to file paperwork into records	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to recognize type or source of paperwork	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of hospital departments	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to file records in place in file room	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of numerical filing system	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of alphabetical filing system	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of color-coded system	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to take orders for charts over the phone	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	How has the level of this skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	How important is this skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	How important is this skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
ability to pull records for appointments or requests	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to deliver records to appropriate location	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to track location of records	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to assemble charts	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to photocopy record information	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work quickly	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to be accurate	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Technical Procedures			
ability to analyze records	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of documentation requirements	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to track down deficiencies	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to communicate with medical staff in writing	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to communicate with medical staff over the phone	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to communicate with medical staff in person	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	How has the level of this skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	How important is this skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	How important is this skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
ability to educate medical staff about documentation requirements	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to code in-patient records	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to code out-patient records	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of ICD-9 codes	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of CPT-4 codes	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of DRGs	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to abstract information from records	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to compile additional hospital statistics (other than abstract)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to do transcription	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Role of Technology			
ability to read handwritten notes	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to read computerized printouts	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to analyze paper record	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

How has the level of this skill or knowledge changed over the past five years?	How important is this skill or knowledge to obtain entry-level job?	How important is this skill or knowledge for advancement?
1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical

Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
ability to analyze computerized record	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to fill out deficiency form	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to enter chart deficiency information into computer	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to enter orders for charts into computer	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to enter requests for information into computer	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to retrieve information from computer	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to use automated record tracking	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to use computerized abstracting system	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to use computerized patient index	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to use computerized birth recording	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to use integrated computer system (info from many dept.'s)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to use fully automated record system	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of computer hardware	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of computer software	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

How has the level of this skill or knowledge changed over the past five years?	How important is this skill or knowledge to obtain entry-level job?	How important is this skill or knowledge for advancement?
1 = no longer important	1 = not at all important	1 = not at all important
2 = less important now	2 = of minor importance	2 = of minor importance
3 = no change	3 = important	3 = important
4 = more important now	4 = very important	4 = very important
5 = much more important	5 = critical	5 = critical

Job skill, ability, or knowledge	Change in past 5 yrs	How important for entry level?	How important to advance?
skill in typing	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in using a computer keyboard	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in using word processing programs	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Requests for Information			
knowledge of laws regarding confidentiality	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to follow department policy regarding confidentiality	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to use judgement when confidentiality procedure is unclear	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to handle legal court orders	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to handle attorney requests	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to handle other law enforcement agency requests	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to handle HIV requests	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to review subpoenas for release	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work with state and federal agencies	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work with medical staff requesting information	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	How has the level of this skill or knowledge changed over the past five years?	How important is this skill or knowledge to obtain entry-level job?	How important is this skill or knowledge for advancement?
	1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
ability to work with the hospital MIS department	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work with the Quality Assurance department	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work with the Finance/Billing department	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work with the Data Processing department	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work with patients	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work with lawyers	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work with researchers	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work with insurance companies	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to read written requests for information	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to respond to requests in writing	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to present information in court	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to read English	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to write English	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to speak English	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

How has the level of this skill or knowledge changed over the past five years?

1 = no longer important
2 = less important now
3 = no change
4 = more important now
5 = much more important

How important is this skill or knowledge to obtain entry-level job?

1 = not at all important
2 = of minor importance
3 = important
4 = very important
5 = critical

How important is this skill or knowledge for advancement?

1 = not at all important
2 = of minor importance
3 = important
4 = very important
5 = critical

Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
ability to speak other languages	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of medical terminology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of anatomy and physiology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of disease processes	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of clinical procedures	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to tabulate statistics	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of basic math	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Organization of Work			
ability to work as a member of a team	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work with multicultural staff	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to supervise other clerks	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to train other clerks	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to follow procedures carefully	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	How has the level of this skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	How important is this skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	How important is this skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
ability to use independent judgement	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in problem solving	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to set priorities	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

1) What is your job title now? ____________________

What is the title of the person to whom you report? ____________________

2) What kind of hospital do you work in (private, public, HMO)? ____________________
How many beds does the hospital have? __________

3) How long have you been in your current position? ____________________

4) Career chronology: please list your titles and occupations in the medical records field or other allied health fields.

Occupation	Title	Length of time in position

5) Please list your associate, bachelor, or advanced degrees and any other medical or allied health degrees, certificates, and dates received and where this training was completed.

Allied Health Degree, Certificate, or Diploma (include major)	Institution/State where completed	Date

6) What skills or knowledge have you found you needed to do your job that you did not learn in school?

7) What skills or knowledge in your postsecondary vocational training for this occupation do you *never* use on your job?

8) What knowledge or skills would you like to acquire that could improve your current job performance?

9) What courses does the hospital offer that are helpful to medical records personnel in their current jobs? What more could the hospital offer?

10) What courses or support does the hospital offer for career advancement in medical records? What more could the hospital do?

11) What workshops or continuing education classes have you attended?

12) Do you feel you have sufficient opportunity to meet with other staff to clarify procedures and keep up with any changes? ____ yes ____ no What kind of further communication would be helpful (up-to-date procedures manual, formal vs. informal meetings, regular vs. periodic meetings) and what would you like to see discussed?

13) In your opinion, what are the important ways to keep up with changes in the medical records field (e.g. through professional journals, participation in professional organizations, peer groups)?

14) What would you like your next job to be?

15) What further training might you need?

16) When in school, did you receive counseling about career and advancement opportunities in the medical records field?
____ yes ____ no How was it or would it have been helpful?

17) What are the current minimum education or certification requirements for entry into your occupation at your organization?

18) Is previous work experience in another allied health profession required for entry into your occupation? ____ yes ____ no
If so, which kind of work experience? If not required, what kinds of previous work experience would have been useful to you?

19) What kinds of changes have occurred in your job in the past few years (in job duties, skills, or the way work gets done)?

20) What kinds of changes do you expect will occur in your occupation in the next few years? Why? Do you think technology will ever replace some of the skilled functions in medical records, such as coding?

21) Please list any skills, knowledge, or abilities that pertain to your job that were not included in the survey.

22) In your opinion, what measures could reasonably be implemented to increase the number of people going into the medical records field?

Medical Records Technician

The following is a list that includes skills and abilities you may need to have and types of knowledge that may be important to your job. For each skill, ability, or knowledge, please indicate (1) how the level of knowledge or skill required for your position has changed in the past five years; (2) how important this knowledge or skill is to obtain an entry-level position; and (3) how important this skill or knowledge is for you to advance in your occupation.

How has the level of this skill or knowledge changed over the past five years?	How important is this skill or knowledge to obtain entry-level job?	How important is this skill or knowledge for advancement?
1 = no longer important	1 = not at all important	1 = not at all important
2 = less important now	2 = of minor importance	2 = of minor importance
3 = no change	3 = important	3 = important
4 = more important now	4 = very important	4 = very important
5 = much more important	5 = critical	5 = critical

Job skill, ability, or knowledge	Change in past 5 yrs	How important for entry level?	How important to advance?
Technical Procedures			
ability to analyze records	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of documentation requirements	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to track down deficiencies	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to communicate with medical staff in writing	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to communicate with medical staff over the phone	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to communicate with medical staff in person	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to educate medical staff about documentation requirements	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to code in-patient records	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

skill or knowledge changed over the past five years?	skill or knowledge to obtain entry-level job?	skill or knowledge for advancement?
1 = no longer important	1 = not at all important	1 = not at all important
2 = less important now	2 = of minor importance	2 = of minor importance
3 = no change	3 = important	3 = important
4 = more important now	4 = very important	4 = very important
5 = much more important	5 = critical	5 = critical

Job skill, ability, or knowledge	Change in past 5 yrs	How important for entry level?	How important to advance?
ability to code ambulatory surgery records	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to code out-patient records	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to code emergency room records	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to code laboratory procedures	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to code diagnoses	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to code procedures	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of ICD-9 codes	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of CPT-4 codes	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of HCPCS	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of E-codes (external cause of injury)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of ICD-O codes (oncology)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of severity indicators	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of DRGs	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to abstract information from records	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	skill or knowledge changed over the past five years?	skill or knowledge to obtain entry-level job?	skill or knowledge for advancement?
	1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
ability to compile additional hospital statistics (other than abstract)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of medical terminology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of anatomy and physiology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of microbiology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of disease processes	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of pharmacology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of clinical procedures	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of Quality Assurance procedures	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of Cancer Tumor Registration	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work quickly	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to be accurate	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Role of Technology			
ability to read handwritten notes	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to read computerized printouts	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

How has the level of this skill or knowledge changed over the past five years?	How important is this skill or knowledge to obtain entry-level job?	How important is this skill or knowledge for advancement?
1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical

Job skill, ability, or knowledge	Change in past 5 yrs	How important for entry level?	How important to advance?
ability to analyze paper record	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to analyze computerized record	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to fill out deficiency form	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to enter chart deficiency information into computer	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to code from paper record	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to code from computerized record	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to do concurrent coding	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to rely on memory for coding	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to consult coding manual	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to use computerized list of codes/classifications	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in looking for co-morbidities and complications	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to rely on encoder prompts for cc's	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in assigning DRGs using own knowledge	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to use computerized grouper to assign DRGs	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
skill in sequencing DRGs using own knowledge	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to optimize reimbursement	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of DRG documentation requirements	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to judge when to disagree with computerized DRG output	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of professional ethics	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to use computerized abstracting system	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to use computerized patient index	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to use automated record tracking	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to use integrated computer system	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to use fully automated record system	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of computer hardware	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of computer software	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of data base management	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of programming	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
knowledge of general capabilities of computer information systems	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to develop new medical records computer functions	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in typing	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in using a computer keyboard	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in transcription	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in using word processing programs	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in using spread sheet programs	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Requests for Information			
knowledge of laws regarding confidentiality	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to follow department policy regarding confidentiality	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to use judgement when confidentiality procedure is unclear	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to handle legal court orders	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to handle attorney requests	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
ability to handle other law enforcement agency requests	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to handle HIV requests	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to review subpoenas for release	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to handle research requests	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work with state and federal agencies	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work with medical staff requesting information	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work with the hospital MIS department	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work with the Quality Assurance department	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work with the Finance/Billing department	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work with the Data Processing department	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work with Medical Records staff as a member of a team	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work with multicultural staff	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work with patients	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work with lawyers	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

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	skill or knowledge changed over the past five years?	skill or knowledge to obtain entry-level job?	skill or knowledge for advancement?
	1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
ability to work with researchers	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work with insurance companies	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to communicate in writing	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to communicate over the phone	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to present information in court	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to write English	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to read English	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to speak English	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to speak other languages	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to tabulate statistics	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to analyze statistics	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to prepare statistical/research reports	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of basic math	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of statistical analysis	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	skill or knowledge changed over the past five years?	skill or knowledge to obtain entry-level job?	skill or knowledge for advancement?
	1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
knowledge of epidemiology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Supervising Skills			
ability to supervise department staff	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to supervise contract personnel	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to organize scheduling of staff	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to listen	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to motivate staff	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to resolve conflicts	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to supervise multicultural staff	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to foster team approach to work	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to train clerks	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to train technicians	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to advise when coding procedure is unclear to staff	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to help set dept. policies for unclear areas in coding	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
ability to advise when DRG assignment is unclear to staff	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to help set dept. policies for unclear areas in DRG assgt.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to help set dept. policies to optimize DRG reimbursement	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to advise when confidentiality procedure is unclear to staff	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to help set dept. policies for confidentiality procedures	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to help set dept. policies for abstracting information	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to help set dept. policies for compiling hospital statistics	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in assessing quality of department's services	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of Quality Assurance procedures	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work with Quality Assurance personnel	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to handle day to day operations	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in problem solving	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to think systematically	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of coursework in supervision	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

1) What is your job title now? ______________________________

What is the title of the person to whom you report? ______________________________

2) What kind of hospital do you work in (private, public, HMO)? ______________________________
How many beds does the hospital have? ______________

3) How long have you been in your current position? ______________________________

4) Career chronology: please list your titles and occupations in the medical records field or other allied health fields.

Occupation	Title	Length of time in position

5) Please list your associate, bachelor, or advanced degrees and any other medical or allied health degrees, certificates, and dates received and where this training was completed.

Allied Health Degree, Certificate, or Diploma (include major)	Institution/State where completed	Date

6) What skills or knowledge have you found you needed to do your job that you did not learn in school?

____

____

7) What skills or knowledge in your postsecondary vocational training for this occupation do you *never* use on your job?

____

____

8) What knowledge or skills would you like to acquire that could improve your current job performance?

____

____

9) What courses does the hospital offer that are helpful to medical records personnel in their current jobs? What more could the hospital offer?

____

____

____

10) What courses or support does the hospital offer for career advancement in medical records? What more could the hospital do?

____

____

____

11) What workshops or continuing education classes have you attended? ____________________

12) Do you feel you have sufficient opportunity to meet with other staff to clarify procedures and keep up with any changes? ____ yes ____ no What kind of further communication would be helpful (up-to-date procedures manual, formal vs. informal meetings, regular vs. periodic meetings) and what would you like to see discussed?

13) In your opinion, what are the important ways to keep up with changes in the medical records field (e.g. through professional journals, participation in professional organizations, peer groups)?

14) What would you like your next job to be? ____________________

15) What further training might you need? ____________________

16) When in school, did you receive counseling about career and advancement opportunities in the medical records field?
____ yes ____ no How was it or would it have been helpful?

17) What are the current minimum education or certification requirements for entry into your occupation at your organization?

18) Is previous work experience in another allied health profession required for entry into your occupation? ____ yes ____ no
If so, which kind of work experience? If not required, what kinds of previous work experience would have been useful to you?

19) What kinds of changes have occurred in your job in the past few years (in job duties, skills, or the way work gets done)?

20) What kinds of changes do you expect will occur in your occupation in the next few years? Why? Do you think technology will ever replace some of the skilled functions in medical records, such as coding?

21) Please list any skills, knowledge, or abilities that pertain to your job that were not included in the survey.

22) In your opinion, what measures could reasonably be implemented to increase the number of people going into the medical records field?

NCRVE STUDY OF CHANGING SKILLS AND EDUCATION REQUIREMENTS IN THE HEALTH PROFESSIONS

Medical Records Administrator

The following is a list that includes skills and abilities you may need to have and types of knowledge that may be important to your job. For each skill, ability, or knowledge, please indicate (1) how the level of knowledge or skill required for your position has changed in the past five years; (2) how important this knowledge or skill is to obtain an entry-level position; and (3) how important this skill or knowledge is for you to advance in your occupation.

	How has the level of this skill or knowledge changed over the past five years?	How important is this skill or knowledge to obtain entry-level job?	How important is this skill or knowledge for advancement?
	1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
General Management Skills			
ability to prepare and monitor budget	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of financial management principles	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of accounting	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to negotiate with outside contractors	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to develop purchasing specifications	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to review contracts	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to manage work flow efficiency	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to assess the quality of the department's services	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	How has the level of this skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	How important is this skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	How important is this skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
ability to manage on-site physical storage of records	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to manage off-site physical storage of records	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of records storage for other than medical records	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to manage change	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to plan several years ahead	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to solve problems systematically	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to provide leadership within the department	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to provide leadership within the hospital	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Managing People			
ability to hire qualified staff	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to develop recruitment strategies	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to organize staff scheduling	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to supervise own staff	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to supervise contract personnel	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	How has the level of this skill or knowledge changed over the past five years?	How important is this skill or knowledge to obtain entry-level job?	How important is this skill or knowledge for advancement?
	1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
ability to listen	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to motivate staff	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to manage multicultural staff	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to manage unionized staff	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to develop team approach to work	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to keep staff informed of all department functions	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to provide on-the-job training to entry-level staff	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to provide on-going training for staff to keep up w/the field	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to support staff development opportunities	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Managing Technology			
abillity to develop new information/management systems	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of general capabilities of computer information systems	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of computer hardware	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	How has the level of this skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	How important is this skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	How important is this skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
knowledge of computer software	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to keep informed of available medical records software	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to keep informed of available financial software	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to develop integrated computer systems w/other departments	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to develop policies for data input into integrated systems	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of computerized patient index	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of automated record tracking	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to assess alternative storage methods	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of computerized microfiche storage	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of optical disk storage	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of fully automated record system	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in using a computer keyboard	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in using word processing programs	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in using spread sheet programs	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	How has the level of this skill or knowledge changed over the past five years?	How important is this skill or knowledge to obtain entry-level job?	How important is this skill or knowledge for advancement?
	1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
Managing Technical Procedures			
ability to keep up with changes in codes (ICD-9, CPT-4, etc.)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to set up a system to inform staff of changes in codes	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to develop policies for unclear areas in coding	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of specific codes	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to keep up with changes in DRG categories	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to set up a system to inform staff of changes in DRG categ's	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to develop policies for unclear areas in DRG assignment	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to develop policies to optimize DRG reimbursement	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of specific DRGs	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of professional ethics	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of medical terminology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of anatomy and physiology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of microbiology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	How has the level of this skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	How important is this skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	How important is this skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
knowledge of disease processes	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of pharmacology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of clinical procedures	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of Quality Assurance procedures	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of Cancer Tumor Registration	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to keep up with documentation requirements	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to develop policies for what should be monitored/analyzed	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to keep up with abstracting requirements	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to develop policies for what should be abstracted	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to develop policies for compiling other hospital statistics	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in using medical records software (grouper, abstractor, etc.)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Managing Requests for Information			
knowledge of laws regarding confidentiality	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to develop information release policies	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	How has the level of this skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	How important is this skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	How important is this skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
knowledge of state and federal reporting requirements	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work with state and federal agencies	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work with medical staff requesting information	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work with patients	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work with lawyers	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work with researchers	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to work with insurance companies	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to communicate in writing	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to communicate over the phone	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to present information in court	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to prepare statistical/research reports	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of data processing/programming	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of statistical analysis	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
knowledge of epidemiology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

	How has the level of this skill or knowledge changed over the past five years? 1 = no longer important 2 = less important now 3 = no change 4 = more important now 5 = much more important	How important is this skill or knowledge to obtain entry-level job? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical	How important is this skill or knowledge for advancement? 1 = not at all important 2 = of minor importance 3 = important 4 = very important 5 = critical
Job skill, ability, or knowledge	**Change in past 5 yrs**	**How important for entry level?**	**How important to advance?**
Managing Hospital Relationships			
ability to communicate with hospital administration	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to communicate with other department managers	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to communicate with MIS personnel	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to communicate with Quality Assurance personnel	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to communicate with Finance/Billing personnel	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to communicate with Data Processing personnel	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to communicate with physicians	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ability to communicate with other medical/professional staff	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in educating other professionals, e.g. about reimbursement	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in diplomacy	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in negotiating	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in coalition building	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
skill in advocating for medical records concerns	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

1) What is your job title now? ______________________________

What is the title of the person to whom you report? ______________________________

2) What kind of hospital do you work in (private, public, HMO)? ______________________________

How many beds does the hospital have? ______________

3) How long have you been in your current position? ______________________________

4) Career chronology: please list your titles and occupations in the medical records field or other allied health fields.

Occupation	Title	Length of time in position

5) Please list your associate, bachelor, or advanced degrees and any other medical or allied health degrees, certificates, and dates received and where this training was completed.

Allied Health Degree, Certificate, or Diploma (include major)	Institution/State where completed	Date

6) What skills or knowledge have you found you needed to do your job that you did not learn in school?

7) What skills or knowledge in your postsecondary vocational training for this occupation do you *never* use on your job?

8) What knowledge or skills would you like to acquire that could improve your current job performance?

9) What courses does the hospital offer that are helpful to medical records personnel in their current jobs? What more could the hospital offer?

10) What courses or support does the hospital offer for career advancement in medical records? What more could the hospital do?

11) What workshops or continuing education classes have you attended?______________________________

____

____

12) Do you feel you have sufficient opportunity to meet with other staff to clarify procedures and keep up with any changes? ____ yes ____ no What kind of further communication would be helpful (up-to-date procedures manual, formal vs. informal meetings, regular vs. periodic meetings) and what would you like to see discussed?

____

____

____

13) In your opinion, what are the important ways to keep up with changes in the medical records field (e.g. through professional journals, participation in professional organizations, peer groups)?

____

____

____

14) What would you like your next job to be?____________________________________

15) What further training might you need? ____________________________________

____

____

16) When in school, did you receive counseling about career and advancement opportunities in the medical records field?
____ yes ____ no How was it or would it have been helpful?

17) What are the current minimum education or certification requirements for entry into your occupation at your organization?

18) Is previous work experience in another allied health profession required for entry into your occupation? ____ yes ____ no
If so, which kind of work experience? If not required, what kinds of previous work experience would have been useful to you?

19) What kinds of changes have occurred in your job in the past few years (in job duties, skills, or the way work gets done)?

20) What kinds of changes do you expect will occur in your occupation in the next few years? Why? Do you think technology will ever replace some of the skilled functions in medical records, such as coding?

21) Please list any skills, knowledge, or abilities that pertain to your job that were not included in the survey.

22) In your opinion, what measures could reasonably be implemented to increase the number of people going into the medical records field?

NCRVE STUDY OF CHANGING SKILLS AND EDUCATION REQUIREMENTS IN THE HEALTH PROFESSIONS

Nursing Survey

The purpose of this survey is to examine the factors affecting labor shortages in nursing occupations. Following is a series of questions about personnel, recruitment, skill requirements, and career paths in the nursing field, and how these factors may have changed in recent years or are expected to change. Please answer all questions as thoroughly as possible.

I. Composition of Nursing Personnel

1) Please indicate below the categories of nursing personnel that are employed by your organization. Check as many as apply.

Registered Nurses ____ BSN ____ ADN
Licensed Vocational Nurses ____ with IV certification ____ without IV certification
Certified Nursing Assistants ____
Other nursing support personnel (please specify job titles) ________________________

2) If both RN/BSNs and RN/ADNs are employed by your organization, are these individuals hired interchangeably into the same jobs? ____ yes ____ no Are they paid on the same scale? ____ yes ____ no

3) If RN/BSNs and RN/ADNs are *not* hired interchangeably, please indicate what differences there are in their initial job assignments.

____

____

____

4) Has the staffing mix of your organization changed over the past 3 to 5 years? _____ yes _____ no If yes, how and why?

5) What changes in staffing mix do you expect over the next 3 to 5 years? Please specify. Why do you think these changes might occur?

II. Recruitment

6) How do you recruit personnel for each of the following nursing categories (e.g. national advertising, local advertising, direct contact with education and training programs, employee referral, etc.)?

RN/BSN ____________________

RN/ADN ____________________

LVN ____________________

CNA ____________________

7) Do your advertisements differentiate hiring preferences between RN/BSNs and RN/ADNs? Please describe.

8) What specifically are the schools from which your organization generally hires for each of the following nursing categories?

RN/BSN ______________________________

RN/ADN ______________________________

LVN ______________________________

CNA ______________________________

9) Are your current recruitment sources adequate to meet the needs for each nursing category in the following areas?

	adequate number of personnel	adequate level of skill	adequate level of experience
RN/BSN	____ yes ____ no	____ yes ____ no	____ yes ____ no
RN/ADN	____ yes ____ no	____ yes ____ no	____ yes ____ no
LVN	____ yes ____ no	____ yes ____ no	____ yes ____ no
CNA	____ yes ____ no	____ yes ____ no	____ yes ____ no

10) If you have difficulty finding qualified personnel, what are the common deficiencies? Please specify.

RN/BSN ______________________________

RN/ADN ______________________________

LVN ______________________________

CNA ______________________________

11) Do newly hired, entry-level personnel have adequate skills in the following areas?

	clinical skills	communication skills	leadership skills
RN/BSN	____ yes ____ no	____ yes ____ no	____ yes ____ no
RN/ADN	____ yes ____ no	____ yes ____ no	____ yes ____ no

	clinical skills	communication skills	leadership skills
LVN	_____ yes _____ no	_____ yes _____ no	_____ yes _____ no
CNA	_____ yes _____ no	_____ yes _____ no	_____ yes _____ no

	knowledge of basic sciences	knowledge of nursing theory	knowledge of nursing assessment
RN/BSN	_____ yes _____ no	_____ yes _____ no	_____ yes _____ no
RN/ADN	_____ yes _____ no	_____ yes _____ no	_____ yes _____ no
LVN	_____ yes _____ no	_____ yes _____ no	_____ yes _____ no
CNA	_____ yes _____ no	_____ yes _____ no	_____ yes _____ no

III. Changing Skill Requirements

12) Please list the three most important skills for entry-level employees in each of the following nursing categories.

RN/BSN 1.____________ 2.____________ 3.____________

RN/ADN 1.____________ 2.____________ 3.____________

LVN 1.____________ 2.____________ 3.____________

CNA 1.____________ 2.____________ 3.____________

13) If you indicated that the skills required for entry-level RN/BSNs and RN/ADNs are different, please explain why this is so.

____

____

____

14) How has this list of most important skills for entry-level personnel changed over the last 3 to 5 years for each nursing category?

RN/BSN ____________________

RN/ADN ____________________

LVN ____________________

CNA ____________________

15) What changes in skill requirements for entry-level personnel do you anticipate over the next 3 to 5 years for each nursing category?

RN/BSN ____________________

RN/ADN ____________________

LVN ____________________

CNA ____________________

IV. Career Paths in Nursing

16) Please describe a typical career path within nursing for the following personnel in your organization, including the attainment of additional nursing degrees.

RN/BSN ____________________

RN/ADN ____________________

LVN ____________________

CNA ____________________

17) Is there a difference in upward mobility for RN/BSNs and RN/ADNS? _____ yes _____ no Please describe.

____

____

____

18) Into what other health care jobs do people in each nursing category move? How do they make this career change (e.g. through additional coursework, additional certificate or degree programs, or on the job training)?

RN/BSN ________________________________

RN/ADN ________________________________

LVN ________________________________

CNA ________________________________

19) If people go back to school for further training in nursing or another field, do they do so _____ full-time or _____ part-time?

20) From what other health care occupations do people make a career change *into* nursing?

____

____

____

21) Do these entrants train to be nurses by studying _____ full-time or _____ part-time?

V. Personal Information

All responses in this survey will be kept confidential. We will disclose only the aggregate results.

22) What kind of hospital do you work in (private, public, HMO)? ____________________
How many beds does the hospital have? __________

23) What is your current job title? ____________________

24) How long have you been in your current position? ____________________

25) Career Chronology: Please list the titles and occupations you have had in the nursing field or other allied health fields.

Occupation	Title	Length of time in position

26) Please list your associate, bachelor, or advanced degrees and any other medical or allied health degrees and certificates.

Allied Health Degree, Certificate, or Diploma (include major)	Institution/State where completed	Date Completed